Reed, Angel

From: Harrigan, Sandra
Sent: Thursday, April 09, 2009 7:45 PM
To: Wendel.Jennifer@epamail.epa.gov; Alfano.Barbara@epamail.epa.gov
Cc: Tanya M Amme; Jones.Katrina@epamail.epa.gov; 'walker.darryl@epamail.epa.gov'; Reed, Angel; Johnson, Andy
Subject: TTEMI-05-003-0051 Kerr-McGee Chemical Company - HRS Documentation Record, Revision 0
Attachments: TTEMI-05-003-0051 Kerr McGee_Doc Record_RV0_040909.pdf

Hello Jennifer and Barbara,

Attached is the HRS documentation record for the Kerr-McGee Chemical Company in Jacksonville, Duval County, Florida. A complete set of the reference package was shipped to the attention of Jennifer for delivery on Friday, April 10, 2009. As requested, the HRS documentation record and complete reference package also were sent to the attention of Tanya Amme at CSC.

Thanks and have a great weekend.

Sandra Harrigan| Project Manager
Direct: 678.775.3088|Cell: 678.773.5428
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11021940

TETRA TECH

April 9, 2009

Ms. Barbara Alfano
Remedial Project Manager
U.S. Environmental Protection Agency
61 Forsyth Street, SW 11th Floor
Atlanta, GA 30303

Subject: **Hazard Ranking System Documentation Record, Revision 0**
Kerr-McGee Chemical Corporation
EPA Contract Number (No.) EP-W-05-054
EPA Identification No. FLD039049101
Technical Direction Document (TDD) No. TTEMI-05-003-0051

Dear Ms. Alfano:

The Tetra Tech Superfund Technical Assessment and Response Team (START) is submitting the Hazard Ranking System (HRS) documentation record, revision 0, for the Kerr-McGee Chemical Corporation located in Jacksonville, Duval County, Florida. This submittal also includes the following:

- National Priorities List (NPL) Characteristics Data Collection Form
- References in hard copy and electronic portable document format (PDF) files on compact disc.

A complete set of the supporting reference materials are not provided in hard copy due to the volume of pages contained in some of the documents. References that are provided as excerpts are noted on the reference list and include References 5, 16, and 63.

At your request, Tetra Tech submitted one full copy of the HRS documentation record and references to CSC Systems and Solutions for EPA Headquarters quality assurance review. Electronic copies of the HRS documentation record and NPL Characteristics Data Collection Form in Microsoft Word and portable document format (PDF) and references in PDF are also enclosed on compact disc.

Please contact me, Sandra Harrigan, at (678) 775-3088 if you have any questions or comments regarding this submittal.

Sincerely,

Sandra Harrigan
START III Project Manager

Andrew F. Johnson
START III Program Manager

Enclosures

cc: Katrina Jones, EPA Project Officer
Darryl Walker, EPA Alternate Project Officer (letter only)
Jennifer Wendel, EPA Region 4 NPL Coordinator
Angel Reed, START III Document Control Coordinator

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HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Kerr-McGee Chemical Corporation (Kerr McGee)

EPA ID No.: FLD039049101

Contact Persons

Documentation Record: Barbara Alfano, Remedial Project Manager
(404) 562-8923
Jennifer Wendel, National Priorities List Coordinator
(404) 562-8799
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street, S.W, 11th Floor
Atlanta, Georgia 30303

Pathways, Components, or Threats Not Scored

The soil exposure and air migration pathways were not scored in this Hazard Ranking System (HRS) documentation record because they are not expected to significantly contribute to the overall score. The surface water migration pathway was not scored because the ground water migration pathway received the maximum pathway score of 100. Actual contamination at Level II concentrations is present in the St. Johns River (Ref. 63). The St. Johns River is a commercial and recreational fishery, as well as a habitat for the federally designated endangered West Indian Manatee, *Trichecus manatus* (Refs. 59; 60).

HRS DOCUMENTATION RECORD

Name of Site:	Kerr-McGee Chemical Corporation (Kerr McGee)
Date Prepared:	April 9, 2009
Street Address of Site*:	1611 Talleyrand Avenue
City, County, State, Zip:	Jacksonville, Duval County, Florida, 32206
General Location in the State:	Northeast corner of state, near the Atlantic Ocean
Topographic Map:	Jacksonville, 1983 and Arlington, Florida, 1982
Latitude:	30.3442° North
Longitude:	-81.6265° West

The coordinates above for Kerr McGee were measured at northwestern corner of the backfilled surface impoundment located in the northern portion of the property (Refs. 3; 4).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area in which the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists its national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be defined as more information is developed as to where the contamination has come to be located.

Scores

Migration Pathway	Pathway Score
Ground Water Migration Pathway	100.00
Surface Water Pathway	Not Scored
Soil Exposure Pathway	Not Scored
Air Migration Pathway	Not Scored
HRS SITE SCORE	**50.00**

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S Pathway	S^2 Pathway
Ground Water Migration Pathway Score (S_{gw})	100	10,000
Surface Water Migration Pathway Score (S_{sw})	Not Scored	Not Scored
Soil Exposure Pathway Score (S_s)	Not Scored	Not Scored
Air Migration Pathway Score (S_a)	Not Scored	Not Scored
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10,000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a) / 4$		2,500
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a) / 4}$		**50.00**

HRS Table 3-1 –Ground Water Migration Pathway Scoresheet

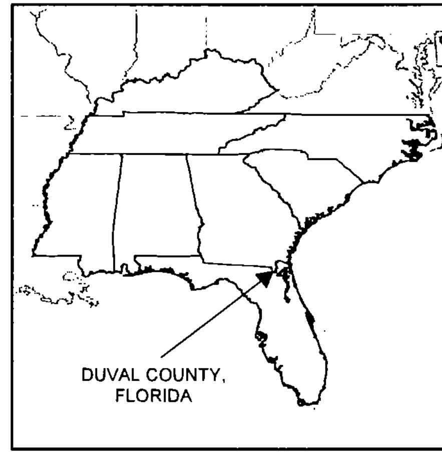
Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	1
2d. Travel Time	35	5
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	90
3. Likelihood of Release (higher of lines 1 and 2e)	550	90
Waste Characteristics:		
4. Toxicity/Mobility	[a]	10,000
5. Hazardous Waste Quantity	[a]	100
6. Waste Characteristics	100	32
Targets:		
7. Nearest Well	50	20
8. Population:		
8a. Level I Concentrations	[b]	0
8b. Level II Concentrations	[b]	0
8c. Potential Contamination	[b]	13,375.9
8d. Population (lines 8a + 8b + 8c)	[b]	13,375.9
9. Resources	5	0
10. Wellhead Protection Area	20	5
11. Targets (lines 7 + 8d + 9 + 10)	[b]	13,380.9
Ground Water Migration Score For An Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100	100
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100	100

Notes:

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

0 500 1,000 Feet
1:12,000

Map Source:
Atlanta Environmental Management, Inc.
Final Feasibility Study – Revision 2, Figure 1-3,
June 2008.
USGS Topographic Quadrangles,
Jacksonville, FL 1983
& Arlington, FL 1982



United States Environmental Protection Agency

KERR McGEE
CHEMICAL CORPORATION
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 1
FACILITY LOCATION

TETRA TECH

LEGEND

- Kerr McGee Chemical Corporation Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Impoundment
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

N

Note:
Fasco - Florida Agricultural and Supply Company

Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC, January 2006;
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC, June 2008.

United States Environmental Protection Agency

KERR McGEE
CHEMICAL CORPORATION
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 2
FACILITY LAYOUT

TETRA TECH

LEGEND

Soil Boring Locations

- Source No. 1 Sample
- Source No. 2 Sample
- Background Sample
- Kerr McGee Chemical Corporation Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Source No. 1
- Source No. 2
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

N

Note:
Fasco - Florida Agricultural and Supply Company

Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC, January 2006;
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC, June 2008.

EPA United States Environmental Protection Agency

KERR McGEE
CHEMICAL CORPORATION
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 3
SOURCE LOCATION

TETRA TECH

LEGEND

Ground Water Sampling Locations

- Observed Release Well
- Background Well
- Kerr McGee Chemical Corporation Property Boundary
- Concrete Pad
- Fill Area
- Foundation
- Adjacent Structures
- Road Outline

0 150 300 Feet

1:3,600

N

Note:
Fasco - Florida Agricultural and Supply Company
MW - Monitoring well
T - Shallow well
TD - Intermediate well
TVD - Deep well

Source:
Aerial photograph, GlobeXplorer, 1/2008;
Shaw Environmental, Inc. Final Remedial Investigation Report prepared for Kerr McGee Chemical, LLC. January 2006;
Atlanta Environmental Management, Inc., Final Feasibility Study, Revision 2, Prepared for Kerr McGee Chemical LLC. June 2008.

United States Environmental Protection Agency

KERR McGEE
CHEMICAL CORPORATION
JACKSONVILLE,
DUVAL COUNTY,
FLORIDA
TDD No.TTEMI-05-003-0051

FIGURE 4
GROUND WATER
OBSERVED RELEASE

TETRA TECH

REFERENCES

1. U. S. Environmental Protection Agency (EPA). Hazard Ranking System, Title 40 Code of Federal Regulations Part 300, 55 Federal Register 51532. December 14, 1990. 138 Pages.

2. EPA. Superfund Chemical Data Matrix. January 2004. Excerpt, 50 Pages. Available on-line at: http://epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm

3. Tetra Tech EM Inc. (Tetra Tech). Map depicting 4-mile Radius. Source of Map: U. S. Geological Survey Topographic Quadrangles Florida: Trout River, 1982; Eastport, 1982; Jacksonville, 1983; and Arlington, 1982. Scale, 1:24,000. 1 Map.

4. Tetra Tech. Project Note to File with Attachment. Subject: Latitude and Longitude Coordinates for the Kerr McGee Chemical Corporation. March 21, 2009. 5 Pages.

5. Shaw Environmental, Inc. Final Remedial Investigation Report, Project No. 806578, Kerr McGee Chemical LLC, Jacksonville, Florida, EPA Identification (ID) Number (No.) FLD039049101. Prepared for Kerr McGee Chemical LLC, Oklahoma City, Oklahoma. January 2006. Excerpt Totaling 888 Pages.

6. Atlanta Environmental Management, Inc. Final Feasibility Study – Revision 2, Document No. 08-141, Former Kerr McGee Chemical LLC Site, Jacksonville, Florida. Prepared for Tronox LLC, Oklahoma City, Oklahoma. June 2008. 391 Pages.

7. Ecology and Environment, Inc., Final Expanded Site Inspection Report, Kerr McGee Chemical Corporation, Jacksonville, Florida, EPA ID No. FLD039049101. Prepared for the Florida Department of Environmental Protection, May 1999. 316 Pages.

8. EPA Envirofacts Warehouse. Facility Detail Report for Kerr McGee Chemical Corporation, EPA ID No. FLD039049101. 2 Pages.

9. Tetra Tech. Project Note to File with Attachment. Subject: Kerr McGee Property Detail from the Duval County, Florida Property Appraiser's Office. April 6, 2009. 4 Pages.

10. EPA Envirofacts Warehouse. Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database Query for Kerr McGee Chemical Corporation, EPA ID No. FLD039049101. Last Updated September 5, 2008. 3 Pages.

11. EPA, Region IV, Administrative Order by Consent for Remedial Investigation/Feasibility Study. Kerr McGee Chemical LLC, Respondent, EPA Docket No.: 00-16-C. March 30, 2000. 54 Pages.

12. Field Investigation Report, Fasco Site, Jacksonville, Florida, October 1993, Prepared by Burlington Environmental Inc., Prepared for Kerr-McGee Chemical Corporation, Oklahoma City, Oklahoma. Project # 42888035. 181 Pages.

13. State of Florida, Department of Environmental Regulation, Office of the Northeast District, Complainant, vs. Kerr-McGee Chemical Corporation, Respondent, Consent Order, OGC Case No. 84-0914. July 3, 1986. 21 Pages.

14. Kerr McGee Corporation, Phase II: History and Phase I Site Evaluation for Groundwater Assessment Plan, prepared by R.A. Delahunt, Senior Environmental Engineer, and H.D. Koechlein, Senior Hydrologist, Kerr McGee Corporation. August 1, 1984. 134 Pages.

15. Kerr McGee Corporation, Phase III Results and Conclusions for the Groundwater Assessment Plan, prepared by R.A. Delahunt, Senior Environmental Engineer, and R.K. Widmann, Hydrologist, Kerr McGee Corporation. March 29, 1985. 205 Pages.

16. Shaw Environmental, Inc. Ecological Risk Screening Evaluation COPEC Refinement, Project No. 806578, Tronox LLC, 1611 Talleyrand Avenue, Jacksonville, Florida, USEPA ID No. FLD039049101. Prepared for Tronox LLC, Oklahoma City, Oklahoma. December 2005. 747 Pages.

17. Shaw Environmental, Inc. Final Human Health Risk Assessment, Kerr-McGee Chemical LLC Site. Prepared for Kerr-McGee Chemical LLC, Oklahoma City, Oklahoma. November 2005. 165 Pages.

18. Phillip Environmental Services Corporation, "Revised Remedial Investigation Report, Jacksonville, Florida," prepared for Kerr McGee Chemical Corporation, Oklahoma City, Oklahoma, January, 1997. 291 Pages.

19. J.J. Crane, Bureau of Operations (BO), Florida Department of Environmental Regulation (FDER), interoffice memorandum through John Gentry, BO, FDER. To Janet Gray, Northeast District, FDER. Subject: Kerr McGee Consent Order - Review and Comments. December 19, 1984. 6 Pages.

20. Reference Reserved

21. Burlington Environmental Inc., "Remedial Investigation Report, Jacksonville, Florida," Prepared for Kerr-McGee Chemical Corporation, Oklahoma City, Oklahoma, Project 11555. April 1994. 408 Pages.

22. LFR Levine-Frick, Responses to Request for Information, Jacksonville Port Authority Property, Talleyrand Marine Terminal, Jacksonville, Florida. Prepared on behalf of Jacksonville Port Authority. October 27, 2000. 288 Pages.

23. IT Corporation, Final Remedial Investigation/Feasibility Study, Sampling And Analysis Plan For Operable Unit 1 (Field Sampling Plan And Quality Assurance Project Plan), Kerr-McGee Chemical LLC Site, Jacksonville, Florida. Prepared for Kerr McGee LLC, Oklahoma City, Oklahoma. Project No. 806578.11030100. October 2000. 448 Pages.

24. St. Johns River Water Management District, Palatka, Florida, Technical Publication SJ 90-8, "Lower St. Johns and St. Marys Ground Water Basins Resource Availability Inventory," Prepared by Michael D. Huff and Margaret McKenzie-Arenberg (1990). 73 Pages.

25. U.S. Geological Survey Professional Paper 1403-D, "Hydrology of the Floridan Aquifer System in Southeast Georgia and Adjacent Parts of Florida and South Carolina," Prepared by Richard E. Krause and Robert B. Randolph (1989). 85 Pages.

26. U.S. Geological Survey, Professional Paper 1403-B, "Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina," Prepared by James A. Miller (1986). 131 Pages.

27. State of Florida, Department of Natural Resources, Division of Interior Resources, Bureau of Geology, Report of Investigations No. 59, "The Shallow-Aquifer System in Duval County, Florida," by Roy F. Fairchild (1972). 57 Pages.

28. State of Florida, Department of Natural Resources, Division of Resource Management, Bureau of Geology, Report of Investigation No. 94, "The Hawthorn Formation of Northeastern Florida, Part I, The Geology of the Hawthorn Formation of Northeastern Florida," Prepared by Thomas M. Scott, Florida Bureau of Geology (1982). 49 Pages.

29. Tetra Tech. Project Note to File with Attachment. Subject: Shaw Environmental, Inc. Remedial Investigation, Chains-of-Custody from 2000 through 2004. April 6, 2009. 102 Pages.

30. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – October 2000. April 6, 2009. 73 Pages.

31. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – November 2000. April 6, 2009. 84 Pages.

32. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – June 2002. April 6, 2009. 217 Pages.

33. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – September 2004. April 6, 2009. 306 Pages.

34. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – May 2002. April 6, 2009. 22 Pages.

35. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – December 2004. April 6, 2009. 76 Pages.

36. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – October 2004. April 6, 2009. 327 Pages.

37. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – December 2000. April 6, 2009. 79 Pages.

38. Tetra Tech. Project Note to File with Attachment. Subject: Calculation of Sample Quantitation Limits for Soil Samples – Kerr McGee Final Remedial Investigation Results. March 30, 2009. 35 Pages.

39. Tetra Tech. Project Note to File with Attachment. Subject: Calculation of Sample Quantitation Limits for Ground Water Samples – Kerr McGee Final Remedial Investigation Results. March 30, 2009. 17 Pages.

40. EPA. Office of Solid Waste and Emergency Response. Hazard Ranking System Guidance Manual. Publication 9345.1-07, PB92-966677, EPA 540-R-92-026. November 1992. 509 Pages. Available on-line at: http://www.epa.gov/superfund/sites/npl/hrsres/#HRS%20Guidance.

41. EPA. *Using Qualified Data to Document an Observed Release and Observed Contamination.* November 1996. 18 Pages.

42. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – October 2000. April 6, 2009. 53 Pages.

43. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – November 2000. April 6, 2009. 50 Pages.

44. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – December 2000. April 6, 2009. 34 Pages.

45. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – May 2002. April 6, 2009. 14 Pages.

46. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – June 2002. April 6, 2009. 98 Pages.

47. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – September 2004. April 6, 2009. 162 Pages.

48. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – October 2004. April 6, 2009. 139 Pages.

49. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – December 2004. April 6, 2009. 45 Pages.

50. Tetra Tech. Project Note to File with Attachment. Subject: Analytical Laboratory Results for the Kerr McGee Final Remedial Investigation – November 2004. April 6, 2009. 264 Pages.

51. Tetra Tech. Project Note to File with Attachment. Subject: Data Validation Reports for the Kerr McGee Final Remedial Investigation Results – November 2004. April 6, 2009. 112 Pages.

52. Florida Department of Environmental Protection. Ground Water Wellhead Protection. Accessed April 4, 2009. Available online at: http://www.dep.state.fl.us/Water/groundwater/wellhead.htm. 2 Pages.

53. CH2MHill. Arlington Water Treatment Plant, Construction and Testing of Water Supply Well No. 5406. Prepared for Jacksonville Electric Authority. July 2003. 153 Pages.

54. Tetra Tech. Project Note to File with Attachment. Subject: Drinking Water Information Obtained from JEA. April 6, 2009. 12 Pages.

55. Jacksonville Electric Authority. Water Utility Service Area for Duval, St. Johns and Nassau. June 2002. 1 Map.

56. U.S. Census Bureau. Duval County, Florida Quickfacts. 2000 Census. 2 Pages.

57. EPA Envirofacts Warehouse. Safe Drinking Water Information System Query Results for Duval County, Florida. Accessed January 14, 2009. 5 Pages.

58. Tetra Tech. Project Note to File. Subject: Review of Validation Qualifiers for Background Samples for the Kerr McGee Final Remedial Investigation. April 7, 2009. 14 Pages.

59. Department of the Interior, Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants; Amendment of Lower St. Johns River Manatee Refuge in Florida. 50 CFR Part 17. Federal Register, Volume 70, Number 81, Rules and Regulations. April 28, 2005. 8 Pages.

60. Fishing and Recreational Activities on the St. Johns River

61. Florida Geological Survey Open File Report 36. The Lithostratigraphy of the Hawthorn Group of Peninsular Florida, by Thomas M. Scott. 1990. 13 Pages.

62. Jacksonville Electric Authority. 2007 Annual Water Quality Report and Water Conservation Guide. 20 Pages.

63. AECOM, Inc. Additional Sediment Sampling Report, Kerr McGee Chemical LLC Site, Jacksonville, Florida, EPA ID Number: FLD039049101, Administrative Order on Consent, USEPA Docket No. 0-16-C. Prepared for Tronox LLC, Oklahoma, Oklahoma City. December 4, 2008. 704 Pages.

64. Tetra Tech. Record of Telephone Conversation with Richard Spechler, US Geological Survey, Hydrologist. Subject: Karst Ground Water Flow in the Floridan Aquifer, Particularly in the Duval County, Florida Area. September 5, 2000. 1 Page.

SITE DESCRIPTION

The Kerr McGee facility is located at 1611 Talleyrand Avenue in Jacksonville, Duval County, Florida (Ref. 8, p. 1) (see Figure 1 of this Hazard Ranking System [HRS] documentation record). The geographic coordinates as measured from the approximate center of Source No. 1, the backfilled surface impoundment are latitude 30.3442° north and longitude -81.6265° west (Ref. 4, p. 2) (see Figure 1 of this HRS documentation record). The property is approximately 31 acres and is currently unoccupied (Refs. 9; 11, p. 3). The EPA identification number as recorded in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database is FLD039049101 (Ref. 10, p. 1). The Kerr McGee property is located in a heavily industrialized area in the Port of Jacksonville (Refs. 3; 7, p. 3-1; 11, p. 3). The property is bordered by a Port of Jacksonville Marine Terminal (currently leased by Toyota) to the north, Deer Creek and industrial properties including CSX Railroad and Jones Chemical to the south, the St. Johns River to the east, and Talleyrand Avenue to the west (Refs. 5, p. 1-2, Figure 1-2; 7, p. 3-1, Figure 1-4).

From 1919 until 1970, operations at the Kerr McGee property included a pesticide and herbicide formulation plant and a fertilizer and sulfuric acid manufacturing plant (Refs. 11, p. 3; 14, p. 10). The pesticide and herbicide formulation and blending plant also known as the Florida Agricultural Supply Company (Fasco) plant was located on the northwestern portion of the property, and the former fertilizer manufacturing plant was located on the eastern portion of the property (Refs. 11, p. 3; 5, Figure 1-2; 14, p. 4). Sulfuric acid was manufactured in a sulfur plant located in the northeastern corner of the property (Ref. 5, p. 1-3, Figure 1-2; 14, p. 4). Kerr McGee also operated a steel drum reconditioning facility near the pesticide storage warehouse. All of the process buildings have been demolished and only their foundations remain on the property (Ref. 11, p. 3). The Kerr McGee property is currently undeveloped and covered in low vegetation such as native grasses and shrubs, with a small wooded area in the east-central portion of the Kerr McGee property (Ref. 5, p. 1-2) (see Figure 2 of this HRS documentation record). The Kerr McGee property is fenced and access is restricted by four locked gates, two located along Talleyrand Avenue, one on the southern fence line, and one on the eastern fence line (Ref. 5, p. 1-2).

Two sources have been identified on the Kerr McGee property: Source No. 1, a backfilled surface impoundment located in the northwestern portion of the property, and Source No. 2, contaminated soil located throughout the property (Refs. 5, Figure 2-2, Appendix G, Tables G-1 through G-4) (see Figure 3 of this HRS documentation record).

OPERATIONAL AND REGULATORY HISTORY

The fertilizer manufacturing plant located at the Kerr McGee property was constructed by Wilson and Toomer Company in 1919 and was sold to Plymouth Cordage in the late 1950s. The Emhart Corporation acquired the plant from Plymouth Cordage in 1965 and subsequently sold the plant to Kerr McGee in 1970. Kerr McGee ceased operation of the facility in 1978. From 1919 until 1970, pesticides and herbicides were formulated and fertilizers and sulfuric acid were manufactured at the facility (Ref. 7, p. 2-2; 14, p. 1).

Production activities at Kerr McGee included sulfur grinding, pesticide and solids blending, spraying of insecticides onto dry granule materials, insecticide and fertilizer mixing, pelletizing of herbicide dusts and powders, emulsifying of insecticides and fish oil soap, and the packaging and bottling of products. At the Fasco plant, pesticides were formulated in liquid, dust, granular, and pelletized form. No active pesticide ingredients were manufactured at Kerr McGee and residual pesticide wastes were containerized and disposed of in landfills off-site. The fertilizer manufacturing plant at Kerr McGee produced superphosphate, a combination of sulfuric acid and ground phosphate rock, and blended agricultural nutrients to form both standard-grade and specialty-grade agricultural fertilizers. Raw materials for the pesticide and fertilizer plant operations were stored inside warehouses on the property. Finished pesticide products were stored in drums until shipped to customers (Refs. 7, p. 2-3; 11, p. 3; 14, pp. 1, 2).

The surface impoundment located north of the Fasco building, functioned as a settling basin for wastewater and spills from the liquid pesticide and herbicide formulation units. Wastewater (including process water and wash water from equipment cleaning) and product formulation residues were directed to the surface impoundment (Refs. 7, p. 2-3; 11, p. 3; 14, p. 5). The Fasco building contained a concrete drainage channel in the floor of the building that ran the length of the building and along the northern side of the pesticide processing units. A sump pit was located near the center of the drainage channel. Wash down water and spills drained into the sump and were then pumped to the surface impoundment (Source No. 1). Clarified water from the surface impoundment was periodically pumped to a dredge/fill pond located in the northern potion of the fertilizer plant. The dredge/fill pond was generally used for drying sediment dredged from the St. Johns River (Refs. 7, p. 2-4; 11, p. 4; 14, p. 6).

In March 2000, Kerr McGee entered into an Administrative Order by Consent (AOC) with EPA for a remedial investigation and feasibility study (RI/FS). The purpose of the RI was to fully determine the nature and extent of the threat to the public health and welfare and/or the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants at or from the facility into the environment. The purpose of the FS was to develop and evaluate alternatives for remedial action to prevent, mitigate, or otherwise respond to the migration or the release or threatened release of hazardous substances, pollutants, or contaminants from the property (Ref. 11, p. 2).

PREVIOUS INVESTIGATIONS

From 1984 to 1998, several soil, ground water, and sediment investigations were conducted at the Kerr McGee property in an effort to characterize the contaminants of concern. These investigations identified metals and pesticides as the primary contaminants of concern.

In August 1998, Ecology and Environment, Inc. (E&E) conducted an expanded site inspection at the Kerr McGee property. During this investigation, E&E identified several possible sources of contamination including a backfilled surface impoundment, various product storage warehouses, former sulfur plant, dredge/fill pond, scrubber sludge disposal pile, and the bulk rail loading and unloading area (Ref. 7, p. 2-3). E&E conducted soil, ground water, and sediment sampling. Composite surface soil samples collected from the former specialty product warehouse area contained several metals at elevated concentrations, including arsenic, beryllium, chromium, and mercury, among others. The concentration of an analyte is considered elevated if the concentration is greater than or equal to three times the background concentration or greater than or equal to the sample quantitation limit if not detected in the background sample. Pesticides, including alpha-chlordane, gamma-chlordane, dichlorodiphenyldichloroethane (DDD), dichlorodiphenyldichloroethylene, p,p- (DDE), Dichlorodiphenyltrichloroethane, 4,4- (DDT), dieldrin, and toxaphene were also detected in surface soil samples at elevated concentrations (Ref. 7, p. 4-1, Tables 4-1 and 5-1, Appendix D). Ground water samples collected from monitoring wells located throughout the property contained arsenic, beryllium, cadmium, chromium, lead, manganese, zinc, alpha-hexachlorocyclohexane (BHC), beta-BHC, gamma-BHC, and toxaphene, among others, at elevated concentrations (Ref. 7, pp. 4-2 and 4-3, Tables 4-1 and 5-1, Appendix D). Sediment samples collected from Deer Creek and the St. John River indicated the presence of arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, zinc, alpha-BHC, beta-BHC, gamma-BHC, alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, and toxaphene, among others at elevated concentrations (Ref. 7, p. 4-2, Tables 4-1 and 4-5, Appendix D).

Between October 2000 and March 2005, Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]), on behalf of Kerr McGee, conducted a RI at the Kerr McGee property. The RI was conducted as part of the AOC (Refs. 5, pp. 1-1, 1-2; 11). The property was divided into two operable units (OU). OU-1 included all land-based (soil and ground water) portions of the property and OU-2 included sediments in the adjacent St. Johns River (Ref. 5, pp. 1-1, 1-2). Soil samples were collected from 0 to 10 feet below land surface (bls) (Ref. 5, p. 2-5). Stainless steel permanent monitoring wells were installed throughout the Kerr McGee property at three depth intervals: shallow (12 to 15 feet bls), intermediate (40 to 45 feet bls), and deep (70 to 75 feet bls) (Ref. 5, p. 2-6). Pesticides and metals were detected in soil and ground water samples collected throughout the property (Ref. 5, Tables 4-2, 4-3, 4-8, Figures 2-2, 2-3).

A lithologic investigation of the backfilled surface impoundment was conducted during the RI. Continuous direct-push soil samples were collected from land surface to a depth of 16 feet bls (Ref. 5, pp. 4-16, 4-17). A layer of green sludge was encountered between 6 and 10 feet bls and a layer of black sludge was encountered between 12 and 13 feet bls (Ref. 5, p. 4-17, Figures 4-38, 4-39). The maximum concentrations of aldrin, dieldrin, alpha-BHC, beta-BHC, gamma-BHC, DDD, DDE, DDT, endrin, heptachlor, toxaphene, and arsenic in soil samples collected during the RI were detected between 6 and 8 feet bls from boring locations adjacent to the northern, western, and eastern edges of the backfilled surface impoundment (Ref. 5, pp. 4-16, 4-17, Tables 4-2 and 4-3, Figure 2-3). Ground water samples collected in the vicinity of the backfilled surface impoundment indicated the presence of alpha-BHC, beta-BHC, and chlorobenzene at elevated concentrations (Ref. 5, pp. 4-28 through 4-32, 4-39, 4-30, Table 4-8, Figures 2-4,3, 4-46 through 4-78).

Surface and subsurface soil samples were collected from the dredge/fill pond area. The soil samples contained arsenic, lead, beta-BHC, and dieldrin at elevated concentrations (Ref. 5, pp. 4-15, 4-16, Tables 4-2 and 4-3, Figures 4-1 through 4-30). Ground water samples collected in the vicinity of the dredge/fill pond indicated the presence of alpha-BHC, beta-BHC, gamma-BHC, DDD, dieldrin, chlorobenzene, and manganese at elevated concentrations (Ref. 5, pp. 4-28 through 4-32, 4-39, 4-30, Table 4-8, Figures 4-46 through 4-78, 4-100).

Sediment samples collected from the St. Johns River contained elevated concentrations of pesticides and metals, including DDD, DDT, arsenic, lead, zinc, and mercury (Ref. 5, pp. 4-45 and 4-46, Table 4-9, Figures 4-101 through 4-111).

Various types of surveys were conducted during the RI. In October 2000, a potable well survey identified 47 known potable wells located within 2 miles of the Kerr McGee property (Ref. 5, pp. 2-2 and 2-3). A bathymetric survey of the bottom of the St. Johns River within 200 feet of the Kerr McGee property was conducted in March 2001 (Ref. 5, p. 2-16). The bathymetric survey included the collection of elevations above mean sea level (amsl) of the top and bottom of the St. Johns River. The elevation readings were used to prepare a contour map depicting contour lines of the water's surface at the Kerr McGee property (Ref. 5, pp. 2-16, 2-17, Figure 2-6). In September 2004, a radiological survey was conducted in the vicinity of the former phosphate scrubber sludge pile located near the southeastern corner of the Kerr McGee property. Several locations exceeded two times background readings for radioactivity (Ref. 5, p. 2-17). In October 2004, a ground-penetrating radar (GPR) survey conducted at the Kerr McGee property did not reveal any anomalies that indicated the presence of buried containers (Ref. 5, pp. 2-17 and 2-18).

In June 2008, an FS was completed for the Kerr McGee property by Atlanta Environmental Management, Inc. (AEM) to evaluate remedial actions that would prevent, mitigate, or otherwise respond to the release or threatened release of contaminants from the Kerr McGee property. Remedial alternatives were developed to address impacts to soil, ground water, and sediment (Ref. 6, p. ES-10). A comprehensive remedy including the implementation of land use controls (LUC), capping, containment, bulkhead construction, and hydraulic controls was selected to address remedial action objectives at the Kerr McGee property (Ref. 6, pp. 7-3, 7-4).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of Source: 1

Name of Source: Backfilled surface impoundment

Source Type: Backfilled surface impoundment

Description and Location of Source (with reference to a map of the site):

Source No. 1, the backfilled surface impoundment, is located at the northwestern corner of the former pesticide formulation plant building (also known as the Fasco building) at the Kerr McGee property (Refs. 13, p. 2; 14, pp. 4, 5, 15). The backfilled surface impoundment was not lined (Refs. 12, p. 3; 14, p. 5). The impoundment was about 100 feet by 100 feet and about 10 feet deep (Ref. 14, p. 5). Liquid, dust, granular, and pelletized formulations of pesticides and herbicides were produced at the Fasco plant (Refs. 12, p. 3; 13, p. 2; 14, p. 3). Pesticide formulation consisted of blending active ingredients, which were purchased and shipped to the plant, with inert materials for commercial and consumer use (Refs. 12, p. 3; 14, pp. 1, 3). Some of the active ingredients included, but not limited to aldrin, chlordane, dieldrin, endrin, BHC, endosulfan, heptachlor, methoxychlor, malathion, and toxaphene (Ref. 14, Appendix A). All liquid pesticide and herbicide products produced at the facility were formulated in the same area of the Fasco plant (Ref. 14, p. 5). Liquid pesticides were blended and bottled in the "Zinoil" units, the Emulsifying unit, the Bottling unit, and the Lime Sulfur unit (Ref. 14, pp. 3, 5). All of these pesticide formulation units were located on the same side of the Fasco building and were in line with each other (Ref. 14, p. 5). Wastewater from the pesticide formulation units was directed to the surface impoundment (Ref. 14, p. 5). A concrete drainage channel (ditch) was located in the floor and ran the length of the building along the north side of the pesticide formulation units (Ref. 14, p. 5). A sump was located in the center of the drainage ditch. All wash down water and spills in the liquid pesticide formulation area drained into the sump and were pumped to the surface impoundment (Refs. 12, p. 3; 13, p. 2; 14, p. 5). Wash down water included water used to clean the liquid pesticide units at the end of each day, and water used to clean equipment when they were changed from one type of pesticide product to another (Ref. 14, p. 6). The surface impoundment was used as a settling pond, and occasionally liquid from the surface impoundment was pumped into the dredge/fill pond located at the fertilizer manufacturing plant, east of the herbicide building (Refs. 13, p. 2; 14, p. 6). When the production of liquid pesticides and herbicides ceased at Kerr McGee, each of the liquid production pesticide and herbicide units was drained into the surface impoundment (Refs. 13, p. 2; 14, p. 8). The units were then rinsed with a soda ash and chlorine solution, which was also drained into the surface impoundment (Ref. 14, p. 8).

In November 1984, Kerr McGee collected sludge samples at multiple depths from two borings advanced in the backfilled surface impoundment (Ref. 15, pp. 11, 13, 14, 15, 24). Both borings contained a grey-green silty sludge layer from 6 to 10 feet bls that was believed to be process sludge deposited at the bottom of the surface impoundment (Ref. 11, 13, 14, 15, 24). Analytical results of the soil and sludge samples revealed the presence of chlordane, toxaphene, and DDT (Ref. 15, p. 25, Appendix A, pp. 8, 9).

During the RI, Shaw collected a soil sample (KMC-IT-SB-3-10) at 10 feet bls from the backfilled surface impoundment below the sludge layer (Ref. 5, Appendix D, p. 12). Analytical results of the sample collected from Source No. 1 during the RI contain alpha-BHC, beta-BHC, gamma-BHC, alpha-chlordane, gamma-chlordane, endrin, DDD, DDE, and dieldrin (Refs. 5, Figure 2-2; 29, p. 8; 30, p. 63).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Source Concentrations

Subsurface soil sample KMC-IT-SB3-10 listed in Table 1 below was collected from Source No. 1 (backfilled surface impoundment) in October 2000 during the RI conducted by Shaw on behalf of Kerr McGee (Ref. 5, Appendix D, p. 12, Appendix G, Table G-1, p. 1). The subsurface soil sample was collected at 10 to 11 feet bls (Ref. 5, Table 2-4, p. 1, Table 4-3, p. 1, Figure 2-2, Appendix D, p. 12, Appendix G, Table G-1). Source No. 1 is a backfilled surface impoundment that was designed to contain pesticide and herbicide waste; therefore, comparison to background is not needed. The subsurface soil sample was analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 30, pp. 63, 64). Chain-of-custody records are contained in Reference 29 and field notes are contained in Reference 5, Appendix D, p. 12. SQLs were calculated using the reporting limits listed in the final RI/FS sampling plan, and the sample-specific percent solids and dilution factors (Refs. 23, Table 6-3; 38, p. 2). The data validation report is contained in Reference 42. The location of sample KMC-IT-SB3-10 is depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this documentation record).

TABLE 1 – Analytical Results for Source No. 1

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration (µg/kg)	SQL (µg/kg)	References
KMC-IT-SB3-10	10/26/2000	Alpha-BHC	15,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	Beta-BHC	7,600	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	Gamma-BHC	3,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	Alpha-chlordane	8,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	Gamma-chlordane	11,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	Endrin	5,700	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	DDD	14,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2
KMC-IT-SB3-10	10/26/2000	DDE	39,000	4,900	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2

TABLE 1 – Analytical Results for Source No. 1					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB3-10	10/26/2000	Dieldrin	28,000	2,500	5, Appendix D, p. 12; 29, p. 8; 30, p. 63; 38, p. 2

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
ID	Identification
IT	IT Corporation
KMC	Kerr McGee Chemical Corporation
µg/kg	Micrograms per kilogram
SB	Soil boring
SQL	Sample quantitation limit

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

From about 1970 to 1978, process wastewater and wash water used to clean equipment on a daily basis from the liquid pesticide formulation units (including the Zinoil, Emulsifying, Bottling, and Lime Sulfur units) at the pesticide formulation plant were discharged into Source No. 1 (the backfilled surface impoundment) (Refs. 12, p. 3; 13, p. 2; 14, pp. 5, 6). When pesticide formulation ceased, the liquid production units in the pesticide formulation plant were drained into the unlined surface impoundment. Also, wash down water consisting of soda ash and chlorine that was generated from cleaning the liquid production units at the time of closure was disposed of in the unlined surface impoundment (Ref. 14, p. 8). Therefore, a containment factor value of 10, as noted in Table 2, was assigned for the ground water migration pathway.

TABLE 2: Containment Factors for Source No. 1

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water: No liner	10	1, Section 3.1.2.1, Table 3-2; 12, p. 3; 14, p. 5
Release via overland migration and/or flood	NS	NA

Notes:

NA Not applicable
NS Not scored

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: Not scored

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: Not scored

2.4.2.1.3 Volume

Based on information provided by Kerr McGee, the dimensions of Source No. 1 are about 100 feet by 100, and about 10 feet deep (Ref. 14, p. 5). Therefore, the capacity of Source No. 1 was about 100,000 cubic feet (ft^3) or 3,703.70 cubic yards (yd^3). During the May 2002 RI sampling event, Shaw advanced soil borings within Source No. 1 to determine the limits of the backfilled surface impoundment (Ref. 5, pp. 4-16, 4-17, Figures 4-38 and 4-47). Based on information collected during the RI, Source No. 1 is about 60 feet by 75 feet, and about 13 feet deep (Ref. 5, p. 4-17, Figure 4-37). Using the RI dimensions, the volume of Source No. 1 is estimated to be 58,500 ft^3 or 2,166.66 yd^3 (60 x 75 x 13 feet deep).

Sum (yd^3): 2,166.66
Equation for Assigning Value (Ref. 1, Table 2-5): 2,166.66 ÷ 13 = 166.66

Volume Assigned Value: 166.66

2.4.2.1.4 Area

The volume of Source No. 1 is provided in Section 2.4.2.13; therefore, area was not evaluated (Ref. 1, Section 2.4.2.1.4).

Area Assigned Value: Not scored

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned from Reference 1, Table 2-5: 166.66

2.2.1 SOURCE IDENTIFICATION

Number of Source: 2

Name of Source: Contaminated Soil Throughout the Kerr McGee Property

Source Type: Contaminated Soil

Description and Location of Source (with reference to a map of the site):

Source No. 2 is comprised of contaminated soil located throughout the Kerr McGee property. The areas of contaminated soil contain hazardous substances including metals, pesticides, and polychlorinated biphenyls (PCB). Soil sampling conducted during several investigations from 1984 to 2005 at Kerr McGee has indicated that contaminated soil is located throughout the entire facility property (Refs. 5, Tables 4-1A, 4-2, 4-3, Appendix G, Tables G-1 through G-4; 18, pp. 10 to 18). Areas of contaminated soil are located in and around the Fasco building foundation, herbicide building, pesticide storage warehouse, northwestern corner of Kerr McGee property, a former burn pit, and drum reconditioning areas of the former pesticide formulation plant (Ref. 5, Tables 4-1A, 4-2, and 4-3, Figures 1-2 and 2-2). Areas of contaminated soil are also located in and around former structures of the fertilizer manufacturing plant including the fertilizer storage warehouse, and the sulfuric acid plant (Ref. 5, Tables 4-1A, 4-2, and 4-3 and 4-4, Figures 1-2 and 2-2).

Analytical results of surface and subsurface soil samples collected by Shaw on behalf of Kerr McGee from October 2000 to September 2004 during the RI indicate the presence of pesticides, including aldrin, alpha-BHC, beta-BHC, total chlordane, DDD, DDE, DDT, dieldrin, heptachlor, heptachlor expoxide, and toxaphene. These pesticides were detected at several locations throughout the Kerr McGee property including under the slab of the herbicide building, along the northern property boundary, north and east of the former herbicide building, in the northwestern portion of the Kerr McGee property, around the perimeter of the backfilled surface impoundment (Source No. 1), between the former machine shop storeroom foundation pad and the former fertilizer building, south of the Fasco building to the former pesticide storage warehouse, and several other areas in the western half of the property (Refs. 5, pp. 4-15, 4-16, Figures 4-31 and 4-34; 6, Figures 2-4 and 2-6).

Analytical results of surface and subsurface soil samples from October 2000 to September 2004 also indicate the presence of arsenic and lead throughout the entire Kerr McGee property. Areas with the highest arsenic and lead concentrations include the middle portion of the property along the long axis, the southwestern and northwestern corners of the property, north of the Fasco building, and under the former herbicide building slab (Refs. 5, p. 4-16, Figures 4-33 and 4-36; 6, Figures 2-5 and 2-7).

Kerr McGee Remedial Investigation October and November 2000 Sampling Event

Background Concentrations

The surface and subsurface soil samples listed in Table 3 were collected in November 2000 during the RI that Shaw conducted on behalf of Kerr McGee RI (Ref. 5, Table 2-4). Background samples were not designated during the RI; therefore, the surface and subsurface soil samples collected from an adjacent property west of the Kerr McGee property were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Surface soil samples KMC-IT-SB25-0 and KMC-IT-SB26-0 were collected from land surface to 1 foot bls (Ref. 5, Appendix D, pp. 21, 39). Subsurface soil samples KMC-IT-SB25-4 and KMC-IT-SB26-4 were collected at depths of 4 to 5 feet bls (Refs. 5, Appendix D, pp. 21, 39; 29, pp. 9, 10). The background surface and subsurface soil samples are comparable to surface and subsurface soil samples collected from Source No. 2 because the samples were collected during the same sampling event, in accordance with the same sampling procedures and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 5-1, 5-2; 29; 40, pp. 2, 4).

The background subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 31, pp. 1, 8). SQLs were calculated using the reporting limits listed in the final RI/FS sampling plan, and the sample-specific percent solids and dilution factors (Refs. 23, Table 6-3; 38, pp. 9, 10). The data validation report for the background samples is contained in Reference 43. Field notes are contained in Appendix D of Reference 5 and chain of custody records are contained in Reference 29. The location of the background samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 3 – Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
Surface Soil Samples					
KMC-IT-SB25-0	11/09/2000	Alpha-BHC	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB26-0	11/15/2000	Beta-BHC	0.85J (8.5)	1.8	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10; 41, p. 16
KMC-IT-SB25-0	11/09/2000	Gamma-BHC	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB25-0	11/09/2000	Alpha-chlordane	1.4J (14)	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9; 41, p. 16
KMC-IT-SB26-0	11/15/2000	Gamma-chlordane	17	3.5	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10
KMC-IT-SB25-0	11/09/2000	DDD	6.5	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9

TABLE 3 – Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB26-0	11/15/2000	DDE	15	3.5	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10
KMC-IT-SB26-0	11/15/2000	DDT	2.3J (29.48)	3.5	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10; 41
KMC-IT-SB26-0	11/15/2000	Dieldrin	1.5J (15)	1.8	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10; 41
KMC-IT-SB25-0	11/09/2000	Endosulfan I	1.8U	1.8	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB25-0	11/09/2000	Endosulfan II	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB25-0	11/09/2000	Endrin	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB25-0	11/09/2000	Endrin aldehyde	3.5U	3.5	5, Appendix D, p. 21; 29, p. 9; 31, p. 8; 38, p. 9
KMC-IT-SB26-0	11/15/2000	Heptachlor	0.61J (6.1)	1.8	5, Appendix D, p. 39; 29, p. 9; 31, p. 1; 38, p. 10; 41
KMC-IT-SB25-0	11/09/2000	Toxaphene	180U	180	5, Appendix D, p. 21; 29, p. 9; 31, p. 8
KMC-IT-SB25-0	11/09/2000	Arsenic	4,600	1,100	5, Appendix D, p. 21; 29, p. 9; 31, p. 9; 38, p. 9
KMC-IT-SB25-0	11/09/2000	Lead	71,000	11,000	5, Appendix D, p. 21; 29, p. 9; 31, p. 9; 38, p. 9
Subsurface Soil Samples					
KMC-IT-SB25-4	11/09/2000	Alpha-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 10
KMC-IT-SB25-4	11/09/2000	Beta-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 10
KMC-IT-SB25-4	11/09/2000	Gamma-BHC	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p.10

TABLE 3 – Background Soil Samples – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB25-4	11/09/2000	Alpha-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p.10
KMC-IT-SB25-4	11/09/2000	Gamma-chlordane	2.1U	2.1	5, Appendix D, p. 21; 29, p. 9; 31, p. 6; 38, p. 10
KMC-IT-SB26-4	11/15/2000	DDD	1.5J (15)	4.1	5, Appendix D, p. 39; 29, p. 9; 31, p. 3; 38, p. 10; 41, p. 16
KMC-IT-SB26-4	11/15/2000	DDE	0.31J (3.1)	4.1	5, Appendix D, p. 39; 29, p. 9; 31, p. 3; 38, p. 0; 41, p. 16
KMC-IT-SB25-4	11/09/2000	Dieldrin	4.1U	4.1	5, Appendix D, p. 21; 29, p. 10; 31, p. 6; 38, p. 10
KMC-IT-SB26-4	11/15/2000	Arsenic	1,600	1,200	5, Appendix D, p. 39; 29, p. 10; 31, p. 4; 38, p. 11
KMC-IT-SB26-4	11/15/2000	Lead	12,000	12,000	5, Appendix D, p. 39; 29, p. 10; 31, p. 4; 38, p. 11

Notes:

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
ID Identification
IT IT Corporation
J The concentration reported is between the method detection limit and reporting limit. Sample results should be considered estimated with an unknown bias. The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC Kerr McGee Chemical Corporation
µg/kg Micrograms per kilogram
SB Soil boring
SQL Sample quantitation limit
U Material was analyzed for but was not detected above the SQL.

Source Concentrations:

The surface and subsurface soil samples listed in Table 4 were collected in October 2000 during the RI that Shaw conducted on behalf of Kerr McGee (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr McGee property (Ref. 5, Figure 2-2). The surface and subsurface soil samples listed in Table 4 were compared to the background surface and subsurface soil samples listed in Table 3. The surface soil samples were collected from 0 to 2 feet bls and the subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. SQLs were calculated using the reporting limits listed in the final sampling plan, and the sample-specific percent solids and dilution factors (Refs. 23, Table 6-3; 38). Analytical results are contained in Reference 30 and data validation reports for the 2000 analytical data packages are contained in Reference 42. The locations of Source No. 2 samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this documentation record).

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration (µg/kg)	SQL (µg/kg)	References
Surface Soil Samples					
KMC-IT-SB2-0	10/26/2000	Alpha-BHC	18,000	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Beta-BHC	7,400	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Gamma-BHC	3,100	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Alpha-chlordane	3,000	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Dieldrin	2,400	1,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Endrin	3,400	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Endrin aldehyde	3,700	2,100	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-0	10/26/2000	Toxaphene	190,000	110,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB4-0	10/24/2000	Beta-BHC	4,300	490	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 28
KMC-IT-SB4-0	10/24/2000	DDD	1,200	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 28
KMC-IT-SB4-0	10/24/2000	DDE	1,800	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 28
KMC-IT-SB4-0	10/24/2000	DDT	11,000	960	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 28
KMC-IT-SB4-0	10/24/2000	Dieldrin	1,200	490	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 28
KMC-IT-SB5-0	10/24/2000	Alpha-BHC	530,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB5-0	10/24/2000	Beta-BHC	200,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB5-0	10/24/2000	Alpha-chlordane	92,000	79,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB5-0	10/24/2000	Gamma-chlordane	96,000	79,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB5-0	10/24/2000	DDD	250,000	79,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB5-0	10/24/2000	Heptachlor	63,000	40,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 38; 38, p. 3
KMC-IT-SB7-0	10/25/2000	Alpha-BHC	440,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 4
KMC-IT-SB7-0	10/25/2000	Beta-BHC	110,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 4
KMC-IT-SB7-0	10/25/2000	Gamma-BHC	89,000	39,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 4

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB8-0	10/25/2000	Alpha-BHC	920,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Beta-BHC	320,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Gamma-BHC	130,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Alpha-chlordane	100,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Gamma-chlordane	93,000	55,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	DDE	230,000	110,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 55; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Arsenic	75,000	1,300	5, Appendix D, p. 11; 29, p. 7; 30, p. 56; 38, p. 6
KMC-IT-SB8-0	10/25/2000	Lead	320,000	13,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 56; 38, p. 6
KMC-IT-SB1	10/26/2000	Alpha-BHC	16,000	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Beta-BHC	5,300	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Gamma-BHC	2,900	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Alpha-chlordane	1,700	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	Gamma-chlordane	1,700	1,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB1	10/26/2000	DDD	6,300	2,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB1	10/26/2000	DDE	3,000	2,000	5, Appendix D, p. 13; 29, p. 8; 30, p. 66; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Alpha-BHC	18,000	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Beta-BHC	5,500	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Gamma-BHC	3,100	980	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Alpha-chlordane	2,100	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	Gamma-chlordane	2,700	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	DDD	15,000	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB2-1	10/26/2000	DDE	3,100	1,900	5, Appendix D, p. 13; 29, p. 8; 30, p. 63; 38, p. 1
KMC-IT-SB4-1	10/24/2000	Alpha-BHC	1,700,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 2
KMC-IT-SB4-1	10/24/2000	Alpha-chlordane	100,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 2
KMC-IT-SB4-1	10/24/2000	Gamma-chlordane	110,000	88,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 2
KMC-IT-SB4-1	10/24/2000	DDD	360,000	170,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 2
KMC-IT-SB4-1	10/24/2000	DDT	590,000	170,000	5, Appendix D, p. 7; 29, p. 4; 30, p. 33; 38, p. 2
KMC-IT-SB4-1	10/24/2000	Arsenic	1,100,000	2,600	5, Appendix D, p. 7; 29, p. 4; 30, p. 34; 38, p. 2

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB4-1-FD	10/24/2000	Alpha-BHC	310,000	22,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 28
KMC-IT-SB4-1-FD	10/24/2000	DDD	62,000	43,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 28
KMC-IT-SB4-1-FD	10/24/2000	DDT	200,000	43,000	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 28
KMC-IT-SB4-1-FD	10/24/2000	Arsenic	480,000	1,300	5, Appendix D, p. 7; 29, p. 5; 30, p. 34; 38, p. 29
KMC-IT-SB5-1	10/24/2000	Alpha-BHC	310,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 4
KMC-IT-SB5-1	10/24/2000	Beta-BHC	110,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 4
KMC-IT-SB5-1	10/24/2000	Gamma-BHC	37,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 4
KMC-IT-SB5-1	10/24/2000	Alpha-chlordane	23,000	17,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 4
KMC-IT-SB5-1	10/24/2000	DDD	180,000	33,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 33; 38, p. 4
KMC-IT-SB9-1	10/24/2000	Alpha-BHC	3,000	610	29, p. 9; 30, p. 26; 38, p. 7
KMC-IT-SB9-1	10/24/2000	Alpha-chlordane	1,100	610	29, p. 9; 30, p. 26; 38, p. 7
KMC-IT-SB9-1	10/24/2000	Gamma-chlordane	800	610	29, p. 9; 30, p. 26; 38, p. 7
KMC-IT-SB9-1	10/24/2000	DDD	18,000	1,200	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 7
KMC-IT-SB9-1	10/24/2000	DDT	6,800	1,200	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 7
KMC-IT-SB9-1	10/24/2000	Lead	310,000	14,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 7

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB13	10/24/2000	DDD	75,000	42,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB13	10/24/2000	Endosulfan I	340,000	22,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB13	10/24/2000	Endosulfan II	130,000	42,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB13	10/24/2000	Arsenic	430,000	6,300	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB13	10/24/2000	Lead	2,600,000	63,000	5, Appendix D, p. 6; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB15-1	10/24/2000	Alpha-chlordane	530	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB15-1	10/24/2000	Gamma-chlordane	560	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB15-1	10/24/2000	DDD	320	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB15-1	10/24/2000	DDE	180	97	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB15-1	10/24/2000	Dieldrin	280	50	5, Appendix D, p. 5; 29, p. 4; 30, p. 26; 38, p. 8
KMC-IT-SB23	10/25/2000	DDD	510,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 9
KMC-IT-SB23	10/25/2000	DDT	420,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 9
KMC-IT-SB23	10/25/2000	Endrin aldehyde	380,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 9
KMC-IT-SB23	10/25/2000	Toxaphene	20,000,000	11,000,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 50; 38, p. 9

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
Subsurface Soil Samples					
KMC-IT-SB7-2	10/25/2000	Alpha-BHC	24,000	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-2	10/25/2000	Beta-BHC	8,200	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-2	10/25/2000	Gamma-BHC	4,600	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-2	10/25/2000	Alpha-chlordane	1,800	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-2	10/25/2000	Gamma-chlordane	1,600	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-2	10/25/2000	Dieldrin	3,300	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB8-2	10/25/2000	Alpha-BHC	4,300,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Beta-BHC	1,300,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Gamma-BHC	1,000,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Alpha-chlordane	320,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Gamma-chlordane	340,000	220,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	DDD	1,000,000	430,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 60; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Arsenic	910,000	8,100	5, Appendix D, p. 11; 29, p. 7; 30, p. 61; 38, p. 6
KMC-IT-SB8-2	10/25/2000	Lead	900,000	81,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 61; 38, p. 6

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	**SQL (µg/kg)**	**References**
KMC-IT-SB7-4	10/25/2000	Alpha-BHC	910,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-4	10/25/2000	Beta-BHC	280,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-4	10/25/2000	Gamma-BHC	170,000	120,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-4	10/25/2000	DDD	330,000	240,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 5
KMC-IT-SB7-4	10/25/2000	Arsenic	120,000	1,500	5, Appendix D, p. 10; 29, p. 7; 30, p. 56; 38, p. 5
KMC-IT-SB7-4-FD	10/25/2000	Alpha-BHC	920,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 29
KMC-IT-SB7-4-FD	10/25/2000	Beta-BHC	300,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 29
KMC-IT-SB7-4-FD	10/25/2000	Gamma-BHC	160,000	59,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 29
KMC-IT-SB7-4-FD	10/25/2000	DDD	300,000	110,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 29
KMC-IT-SB7-4-FD	10/25/2000	DDE	120,000	110,000	5, Appendix D, p. 10; 29, p. 7; 30, p. 55; 38, p. 29
KMC-IT-SB7-4-FD	10/25/2000	Arsenic	140,000	1,400	5, Appendix D, p. 10; 29, p. 7; 30, p. 56; 38, p. 29
KMC-IT-SB8-4	10/25/2000	Alpha-BHC	2,000,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 6
KMC-IT-SB8-4	10/25/2000	Beta-BHC	470,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 6
KMC-IT-SB8-4	10/25/2000	Gamma-BHC	280,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 6

TABLE 4 – Analytical Results for Source No. 2 – October and November 2000 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration (µg/kg)**	***SQL (µg/kg)**	**References**
KMC-IT-SB8-4	10/25/2000	Alpha-chlordane	120,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 6
KMC-IT-SB8-4	10/25/2000	Gamma-chlordane	120,000	96,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 7
KMC-IT-SB8-4	10/25/2000	DDD	530,000	190,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 58; 38, p. 6
KMC-IT-SB8-4	10/25/2000	Arsenic	210,000	1,400	5, Appendix D, p. 11; 29, p. 7; 30, p. 59; 38, p. 6
KMC-IT-SB8-4	10/25/2000	Lead	490,000	14,000	5, Appendix D, p. 11; 29, p. 7; 30, p. 59; 38, p. 6
KMC-IT-SB11-4	10/25/2000	Alpha-chlordane	3,800	1,600	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 7
KMC-IT-SB11-4	10/25/2000	Gamma-chlordane	4,400	1,600	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 7
KMC-IT-SB11-4	10/25/2000	DDD	13,000	1,600	5, Appendix D, p. 9; 29, p. 6; 30, p. 44; 38, p. 7
KMC-IT-SB4-5	10/24/2000	Beta-BHC	110	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 3
KMC-IT-SB4-5	10/24/2000	Alpha-chlordane	15	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 3
KMC-IT-SB4-5	10/24/2000	Gamma-chlordane	15	11	5, Appendix D, p. 7; 29, p. 5; 30, p. 33; 38, p. 3

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
FD	Field duplicate
ID	Identification
IT	IT Corporation
KMC	Kerr McGee Chemical Corporation
µg/kg	Micrograms per kilogram
SB	Soil boring
SQL	Sample quantitation limit

Kerr McGee Remedial Investigation May and June 2002 Sampling Event

Background Concentrations

Surface and subsurface soil samples listed in Table 5 were collected in June 2002 during the RI that Shaw conducted on behalf of Kerr McGee (Ref. 5, Table 2-4). Background samples were not designated during the RI; therefore, the surface and subsurface soil samples collected in the southwestern portion of the Kerr McGee property were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Surface and subsurface soil samples KMC-IT-SB64-0 and KMC-IT-SB64-4 were collected in the southwestern corner of the Kerr McGee property (Ref. 5, Figure 2-2). Surface soil sample KMC-IT-SB64-0 was collected at a depth of 0 to 1 foot bls (Refs. 5, Table 2-4, Appendix D, p. 52; 29, p. 33). Subsurface soil sample KMC-IT-SB64-4 was collected at a depth of 4 to 5 feet bls (Refs. 5, Table 2-4, Appendix D, p. 52; 29, p. 32). The background surface and subsurface soil samples are comparable to surface and subsurface soil samples collected from Source No. 2 because the samples were collected during the same sampling event, in accordance with the same sampling procedures and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 5-1, 5-2; 29; 40, pp. 2, 4). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. The locations of the background surface and subsurface soil samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

The background surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010 and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 32, pp. 53, 55, 77, 79). SQLs were calculated using the reporting limits listed in the RI/FS final sampling plan, and the sample-specific percent solids and dilution factors (Refs. 23, Table 6-3; 38). Data validation reports for the May and June 2002 analytical data packages are contained in References 45 and 46.

TABLE 5 – Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
Surface Soil Sample					
KMC-IT-SB64-0-RE	06/05/2002	Alpha-BHC	2.0UJ µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 31; 41, p. 16
KMC-IT-SB64-0-RE	06/05/2002	Beta-BHC	2.0J (20) µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 31; 41, p. 16
KMC-IT-SB64-0-RE	06/05/2002	Gamma-BHC	2.0UJ µg/kg	2.0 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 34; 41, p. 17

TABLE 5 – Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-IT-SB64-0-RE	06/05/2002	Gamma-chlordane	3.0J (30) µg/kg	3.8 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 32; 41, p. 17
KMC-IT-SB64-0-RE	06/05/2002	DDD	2.5J (25) µg/kg	3.8 µg/kg	5, Appendix D, p. 52, 5, Appendix G, Table G-1, p. 17; 29, p. 33; 32, p. 77; 38, p. 31; 41, p. 16
KMC-IT-SB64-0-RE	06/05/2002	DDE	16J (160) µg/kg	3.8 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 32; 41, p. 16
KMC-IT-SB64-0-RE	06/05/2002	DDT	12J (153.84) µg/kg	3.8 µg/kg	5, Appendix D, p. 52, Appendix G, Table G-1, p. 16; 29, p. 33; 32, p. 77; 38, p. 32; 41, p. 16
KMC-IT-SB64-0-RE	06/05/2002	Dieldrin	3.0J (35.79) µg/kg	2.0 µg/kg	5, Appendix D, p. 52; 29, p. 33; 32, p. 77; 38, p. 32; 41, p. 16
KMC-IT-SB64-0	06/05/2002	Arsenic	5.6 mg/kg	1.2 mg/kg	5, Appendix D, p. 52; 29, p. 33; 32, p. 79; 38, p. 16
KMC-IT-SB64-0	06/05/2002	Lead	60 mg/kg	12 mg/kg	5, Appendix D, p. 52; 29, p. 33; 32, p. 79; 38, p. 16
Subsurface Soil Sample					
KMC-IT-SB64-4-RE	06/05/2002	Alpha-BHC	2.9UJ µg/kg	2.9 µg/kg	5, Appendix D, p. 52; 29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. 1
KMC-IT-SB64-4-RE	06/05/2002	Beta-BHC	9.4J µg/kg	2.9 µg/kg	29, p. 32; 32, p. 55; 38, p. 32; 41, p. 16; 58, p. 1
KMC-IT-SB64-4-RE	06/05/2002	Gamma-BHC	2.9UJ µg/kg	2.9 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 58, p. 1
KMC-IT-SB64-4-RE	06/05/2002	Alpha-chlordane	2.7J (27) µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. 1
KMC-IT-SB64-4-RE	06/05/2002	DDD	13 µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. i
KMC-IT-SB64-4-RE	06/05/2002	DDE	3.0J (30) µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. 2

TABLE 5 – Background Soil Samples for May and June 2002 Sampling Events					
Sample ID[1]	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-IT-SB64-4-RE	06/05/2002	DDT	1.4J (17.94) µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. 2
KMC-IT-SB64-4-RE	06/05/2002	Endrin ketone	5.7UJ µg/kg	5.7 µg/kg	29, p. 32; 32, p. 53; 38, p. 32; 41, p. 16; 58, p. 3
KMC-IT-SB64-4	06/05/2002	Arsenic	8.7 mg/kg	1.7 mg/kg	29, p. 32; 32, p. 55; 38, p. 17
KMC-IT-SB64-4	06/05/2002	Lead	57 mg/kg	17 mg/kg	29, p. 32; 32, p. 55; 38, p. 17

Notes:

1	Samples KMC-IT-SB64-0 and KMC-IT-SB64-4 were reanalyzed. Concentrations presented are those of the reanalysis.
BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
IT	IT Corporation
J	The concentration reported is between the method detection limit and reporting limit. Sample results should be considered estimated with an unknown bias. The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr McGee Chemical Corporation
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
SB	Soil boring
SQL	Sample quantitation limit
U	Material was analyzed for, but not detected.

Source Concentrations

The source surface and subsurface soil samples listed in Table 6 were collected in May and June 2002 during the RI that Shaw conducted on behalf of Kerr McGee (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr McGee property (Ref. 5, Figure 2-2). The source surface and subsurface soil samples listed in Table 6 were compared to the background surface and subsurface soil samples listed in Table 5. The source surface soil samples were collected from 0 to 2 feet bls and the source subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The source surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. SQLs were calculated using the reporting limits listed in the final RI/FS sampling plan, and the sample-specific percent solids and dilution factors (Refs. 23, Table 6-3; 38). Analytical results are contained in References 32 and 34, and data validation reports for the 2002 analytical data packages are contained in References 45 and 46. The locations of the source surface and subsurface soil samples are provide on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

TABLE 6: Analytical Results for Source No. 2 – May and June 2002 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration	SQL	References
Surface Soil Samples					
KMC-IT-SB36-0	06/03/2002	Arsenic	1,800 mg/kg	12 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 32; 38, p. 12
KMC-IT-SB36-0	06/03/2002	Lead	350 mg/kg	120 µg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 32; 38, p. 12
KMC-IT-SB41-0	06/03/2002	Dieldrin	160 µg/kg	21 µg/kg	5, Appendix D, p. 50; 29, p. 29; 32, p. 27; 38, p. 13
KMC-IT-SB41-0	06/03/2002	Arsenic	110 mg/kg	1.2 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 14
KMC-IT-SB41-0	06/03/2002	Lead	1,400 mg/kg	12 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 14
KMC-IT-SB47-0	05/31/2002	Beta-BHC	15,000 µg/kg	8,400 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 14
KMC-IT-SB47-0	05/31/2002	DDD	150,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 14
KMC-IT-SB47-0	05/31/2002	DDE	40,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 14

TABLE 6: Analytical Results for Source No. 2 – May and June 2002 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-IT-SB47-0	05/31/2002	DDT	180,000 µg/kg	16,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 13; 38, p. 14
KMC-IT-SB57-0	05/28/2002	Gamma-chlordane	1,100 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 31
KMC-IT-SB57-0	05/28/2002	DDD	9,500 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 31
KMC-IT-SB57-0	05/28/2002	DDE	3,500 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 31
KMC-IT-SB57-0	05/28/2002	DDT	7,100 µg/kg	770 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 1; 38, p. 31
KMC-IT-SB52-2	05/29/2002	Alpha-BHC	170,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB52-2	05/29/2002	Beta-BHC	41,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB52-2	05/29/2002	Gamma-BHC	64,000 µg/kg	38,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB52-2	05/29/2002	DDT	860,000 µg/kg	73,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
Subsurface Soil Samples					
KMC-IT-SB36-4	06/03/2002	Arsenic	44 mg/kg	1.4 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 36; 38, p. 13
KMC-IT-SB36-4	06/03/2002	Lead	190 mg/kg	14 mg/kg	5, Appendix D, p. 51; 29, p. 29; 32, p. 36; 38, p. 13
KMC-IT-SB41-4	06/03/2002	Arsenic	410 mg/kg	1.3 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 30
KMC-IT-SB41-4	06/03/2002	Lead	2,100 mg/kg	13 mg/kg	5, Appendix D, p. 50; 29, p. 29; 32, pp. 28, 29; 38, p. 30
KMC-IT-SB47-4	05/31/2002	DDD	180,000 µg/kg	43,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 4; 38, p. 14

TABLE 6: Analytical Results for Source No. 2 – May and June 2002 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-IT-SB47-4	05/31/2002	DDT	56,000 µg/kg	43,000 µg/kg	5, Appendix D, p. 47; 29, p. 26; 32, p. 4; 38, p. 14
KMC-IT-SB50-4	05/31/2002	Beta-BHC	100,000 µg/kg	24,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 15
KMC-IT-SB50-4	05/31/2002	Alpha-chlordane	55,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 15
KMC-IT-SB50-4	05/31/2002	DDD	350,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 15
KMC-IT-SB50-4	05/31/2002	DDT	280,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 15
KMC-IT-SB50-4	05/31/2002	Endrin ketone	160,000 µg/kg	46,000 µg/kg	5, Appendix D, p. 46; 29, p. 26; 32, p. 1; 38, p. 15
KMC-IT-SB52-6	05/29/2002	Alpha-BHC	3,600,000 µg/kg	490,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB52-6	05/29/2002	Gamma-BHC	1,800,000 µg/kg	490,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB52-6	05/29/2002	DDT	12,000,000 µg/kg	940,000 µg/kg	5, Appendix D, p. 124; 29, p. 24; 34, p. 10; 38, p. 15
KMC-IT-SB53-8	05/28/2002	DDD	1,300,000 µg/kg	570,000 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 30
KMC-IT-SB53-8	05/28/2002	DDE	4,600,000 µg/kg	570,000 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 30
KMC-IT-SB53-13	05/28/2002	DDD	51,000 µg/kg	3,900 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 30
KMC-IT-SB53-13	05/28/2002	DDE	13,000 µg/kg	3,900 µg/kg	5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 30

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
IT	IT Corporation
KMC	Kerr McGee Chemical Corporation
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
SB	Soil boring
SQL	Sample quantitation limit

Kerr McGee Remedial Investigation September 2004 Sampling Event

Background Concentrations

Background surface and subsurface soil samples listed in Table 7 were collected in September 2004 during the RI that Shaw conducted on behalf of Kerr McGee RI (Ref. 5, Table 2-4). Background samples were not designated during the RI; therefore, the surface and subsurface soil samples collected in the eastern portion of the Kerr McGee property were selected to represent background conditions for comparison to samples collected from Source No. 2 (Ref. 5, Figure 2-2). Surface soil sample KMC-SEI-SB154-0 was collected in the eastern portion of the Kerr McGee property (Ref. 5, Figure 2-2). Subsurface soil samples KMC-SEI-SB-135-4 and KMC-SEI-SB-135-8 were collected in the southern portion of the Kerr McGee property (Ref. 5, Figure 2-2). Surface soil sample KMC-SEI-SB154-0 was collected at a depth of 0 to 1 foot bls (Refs. 5, Table 2-4, p. 7; 29, p. 54). Surface soil sample KMC-SEI-154-0 could not be located in Reference 5, Appendix D. Subsurface soil sample KMC-SEI-SB-135-4 was collected at a depth of 4 to 5 feet bls and subsurface soil sample KC-SEI-SB-135-8 was collected at a depth of 8 to 9 feet bls (Refs. 5, Table 2-4, Appendix D, pp. 222; 29, p. 52). The background surface and subsurface soil samples are comparable to surface and subsurface soil samples collected from Source No. 2 because the samples were collected during the same sampling event, in accordance with the same sampling procedures and from the same soil type (Refs. 5, pp. 2-1, 2-5, 2-6, Figure 2-2, Table 2-4; 23, pp. 5-1, 5-2; 29; 40, pp. 2, 4). Logbook notes are contained in Appendix D of Reference 5 and chain-of-custody records are contained in Reference 29. The locations of the background samples are depicted on Figure 2-2 of Reference 5 (also see Figure 3 of this HRS documentation record).

The background surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Refs. 5, Table 2-5; 33, p. 146). SQLs were calculated using the reporting limits listed in the analytical data packages and the sample-specific percent solids and dilution factors (Refs. 33, pp. 167, 168). Data validation reports for the September and November 2004 sampling events are contained in References 47 and 51.

TABLE 7 – Background Soil Samples for September and November 2004 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration	SQL	References
Surface Soil Samples – September 2004					
KMC-SEI-SB154-0	09/17/2004	Alpha-BHC	3.4 µg/kg	2.4 µg/kg	29, p. 54; 33, p. 241; 38, p. 27
KMC-SEI-SB154-0	09/17/2004	Beta-BHC	2.2J (22) µg/kg	2.4 µg/kg	29, p. 54; 33, p. 241; 38, p. 27; 41, p. 16
KMC-SEI-SB154-0	09/17/2004	Gamma- BHC	1.9J (22.40) µg/kg	2.4 µg/kg	29, p. 54; 33, p. 241; 38, p. 27; 41, p. 17
KMC-SEI-SB154-0	09/17/2004	DDD	4.1J (41) µg/kg	4.6 µg/kg	29, p. 54; 33, p. 241; 38, p. 27; 41, p. 16; 58, p. 6
KMC-SEI-SB154-0	09/17/2004	DDE	7.1 µg/kg	4.6 µg/kg	29, p. 54; 33, p. 241; 38, p. 27

TABLE 7 – Background Soil Samples for September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-SEI-SB154-0	09/17/2004	DDT	10J (128.2) µg/kg	4.6 µg/kg	29, p. 54; 33, p. 241; 38, p. 27; 41, p. 16; 58, p. 6
KMC-SEI-SB154-0	09/17/2004	Dieldrin	0.88J (10.49) µg/kg	4.6 µg/kg	29, p. 54; 33, p. 241; 38, p. 27; 41, p. 16; 58 p. 6
KMC-SEI-SB154-0	09/17/2004	Arsenic	12 mg/kg	1.1 mg/kg	29, p. 54; 33, p. 240; 38, p. 27
KMC-SEI-SB154-0	09/17/2004	Lead	570 mg/kg	0.69 mg/kg	29, p. 54; 33, p. 240; 38, p. 27
Subsurface Soil Samples – September 2004					
KMC-SEI-SB135-4	09/16/2004	Aldrin	1.9U µg/kg	1.9 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-4	09/16/2004	Alpha-BHC	1.9U µg/kg	1.9 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-4	09/16/2004	Dieldrin	3.7U µg/kg	3.7 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-4	09/16/2004	Lead	32 mg/kg	11 mg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-8	09/16/2004	Alpha-BHC	2.2U µg/kg	2.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-8	09/16/2004	Gamma- BHC	2.2U µg/kg	2.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-8	09/16/2004	Alpha-chlordane	4.1J (41) µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21; 41, p. 16; 58, p. 4
KMC-SEI-SB135-8	09/16/2004	DDD	5.9 µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-8	09/16/2004	DDE	6.8 µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 52; 33, p. 146; 38, p. 21
KMC-SEI-SB135-8	09/16/2004	DDT	3.4J (43.58) µg/kg	4.2 µg/kg	5, Appendix D, p. 222; 29, p. 9; 33, p. 146; 38, p. 21; 41, p. 16

Notes:

BHC	Hexachlorocyclohexane
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene, p,p-
DDT	Dichlorodiphenyltrichloroethane, 4,4-
ID	Identification
J	The concentration reported is between the method detection limit and reporting limit. Sample results should be considered estimated with an unknown bias. The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by applying EPA fact sheet *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 1996) (Ref. 41)
KMC	Kerr McGee Chemical Corporation
µg/kg	Micrograms per kilogram
mg/kg	Micrograms per kilogram
SEI	Shaw Environmental, Inc.
SQL	Sample quantitation limit
U	Material was analyzed for but was not detected above the SQL.

Source Concentrations

The source surface and subsurface soil samples listed in Table 8 were collected in September and November 2004 during the RI that Shaw conducted on behalf of Kerr McGee (Ref. 5, Table 2-4). The samples were collected from several locations at the former pesticide formulation and fertilizer manufacturing plants at the Kerr McGee property (Ref. 5, Figure 2-2). The source surface and subsurface soil samples listed in Table 8 were compared to the background surface and subsurface soil samples listed in Table 7. The source surface soil samples were collected from 0 to 2 feet bls and the subsurface soil samples were collected from depths greater than 2 feet bls (Ref. 5, Appendix D). The surface and subsurface soil samples were analyzed for arsenic and lead using EPA Method 6010, and pesticides using EPA Method 8081 (Ref. 5, Table 2-5). Logbook notes are contained in Reference 5, Appendix D and chain-of-custody records are contained in Reference 29. SQLs were calculated using the reporting limits listed in the analytical data packages and the sample-specific percent solids and dilution factors (Refs. 33, pp. 22, 39, 136, 167, 168, 187, 228, 263, 300, 301; 38). Data validation reports for the September and November 2004 sampling events are contained in References 47 and 51). The locations of the source surface and subsurface soil samples are depicted on Figure 2-2 of Reference 5 (see Figure 3 of this HRS documentation record).

TABLE 8 – Analytical Results for Source No. 2 – September and November 2004 Sampling Events

Sample ID	Date	Hazardous Substance	Hazardous Substance Concentration	SQL	References
Surface Soil Samples					
KMC-SEI-SB116-0	09/16/2004	Beta-BHC	3,700 µg/kg	1,700 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 207; 38, p. 19
KMC-SEI-SB117-0	09/16/2004	DDD	93,000 µg/kg	7,900 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 20
KMC-SEI-SB117-0	09/16/2004	DDE	17,000 µg/kg	2,000 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 20
KMC-SEI-SB117-0	09/16/2004	DDT	110,000 µg/kg	7,900 µg/kg	5, Appendix D, p. 218; 29, p. 51; 33, p. 206; 38, p. 20
KMC-SEI-SB140-0	09/20/2004	Dieldrin	380 µg/kg	180 µg/kg	5, Appendix D, p. 218; 29, p. 55; 33, p. 244; 38, p. 23
KMC-SEI-SB141-0	09/23/2004	Arsenic	180 mg/kg	1.3 mg/kg	5, Appendix D, p. 241; 29, p. 59; 33, p. 281; 38, p. 25

TABLE 8 – Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-SEI-SB143-0	11/04/2004	Gamma-chlordane	200 µg/kg	45 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 35
KMC-SEI-SB143-0	11/04/2004	DDE	75 µg/kg	4.4 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 35
KMC-SEI-SB143-0	11/04/2004	Dieldrin	200 µg/kg	88 µg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 35
KMC-SEI-SB143-0	11/04/2004	Arsenic	190 mg/kg	1.1 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 36
KMC-SEI-SB143-0	11/04/2004	Lead	1,400 mg/kg	0.67 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 36
KMC-SEI-SB151-0	09/16/2004	Arsenic	500 mg/kg	1.3 mg/kg	5, Appendix D, p. 226; 29, p. 71; 33, p. 177; 38, p. 25
KMC-SEI-SB151-0	09/16/2004	Lead	3,100 mg/kg	13 mg/kg	5, Appendix D, p. 226; 29, p. 71; 33, p. 177; 38, p. 25
KMC-SEI-SB152-0	09/17/2004	Dieldrin	120 µg/kg	21 µg/kg	5, Appendix D, p. 167; 29, p. 54; 33, p. 238; 38, p. 32
KMC-SEI-SB136-1	09/17/2004	Alpha-BHC	16,000 µg/kg	2,700 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 22
KMC-SEI-SB136-1	09/17/2004	Gamma-BHC	5,000 µg/kg	2,700 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 22
KMC-SEI-SB136-1	09/17/2004	DDD	3,000,000 µg/kg	530,000 µg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 22

TABLE 8 – Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-SEI-SB136-1	09/17/2004	DDT	3,000,000 μg/kg	530,000 μg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 241; 38, p. 22
KMC-SEI-SB137-1	09/17/2004	Alpha-BHC	590,000 μg/kg	130,000 μg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 22
KMC-SEI-SB137-1	09/17/2004	DDD	350,000 μg/kg	260,000 μg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 22
KMC-SEI-SB137-1	09/17/2004	DDT	1,200,000 μg/kg	260,000 μg/kg	5, Appendix D, p. 167; 29, p. 55; 33, p. 244; 38, p. 22
KMC-SEI-SB139-1	09/17/2004	Dieldrin	250 μg/kg	53 μg/kg	29, p. 55; 33, p. 244; 38, p. 23
Subsurface Soil Samples					
KMC-SEI-SB123-3	11/04/2004	Dieldrin	450 μg/kg	81 μg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 35
KMC-SEI-SB125-3	09/15/2004	Lead	1,500 mg/kg	13 mg/kg	5, Appendix D, p. 209; 29, p. 49; 33, p. 124; 38, p. 21
KMC-SEI-SB141-3	09/23/2004	Lead	1,900 mg/kg	12 mg/kg	5, Appendix D, p. 241; 29, p. 59; 33, p. 281; 38, p. 25
KMC-SEI-SB143-3	11/04/2004	Lead	1,900 mg/kg	0.67 mg/kg	5, Appendix D, p. 169; 29, p. 73; 38, p. 33; 50, p. 36
KMC-SEI-SB120-7	09/20/2004	Alpha-BHC	100,000 μg/kg	18,000 μg/kg	29, p. 54; 33, p. 238; 38, p. 21
KMC-SEI-SB120-7	09/20/2004	Gamma-BHC	65,000 μg/kg	18,000 μg/kg	29, p. 54; 33, p. 238; 38, p. 21
KMC-SEI-SB120-7	09/20/2004	Alpha-chlordane	36,000 μg/kg	18,000 μg/kg	29, p. 54; 33, p. 238; 38, p. 21
KMC-SEI-SB120-7	09/20/2004	DDD	160,000 μg/kg	36,000 μg/kg	29, p. 54; 33, p. 238; 38, p. 20

TABLE 8 – Analytical Results for Source No. 2 – September and November 2004 Sampling Events					
Sample ID	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**SQL**	**References**
KMC-SEI-SB120-7	09/20/2004	DDT	280,000 µg/kg	36,000 µg/kg	29, p. 54; 33, p. 238; 38, p. 20

Notes:

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
ID Identification
KMC Kerr McGee Chemical Corporation
µg/kg Micrograms per kilogram
mg/kg Milligrams per kilogram
SB Soil boring
SEI Shaw Environmental, Inc.
SQL Sample quantitation limit

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Historical evidence indicates releases of pesticides and pesticide components to the surficial aquifer beneath the facility property (Refs. 12, Table 3-2, Figure 2-1; 13, pp. 4, 5, Exhibit IV; 18, pp. 18, 19, 20, 21, 22) (see Section 2.2.2 of this HRS documentation record). Logbooks documenting the collection of soil samples within Source No. 2 do not document the presence of a liner below Source No. 2 (Ref. 5, Appendix D). This information, applied to Table 3-2 in Reference 1, yields a containment value of 10.

TABLE 9: Containment Factors for Source No. 2

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to groundwater: No liner	10	1, Section 3.1.2.1, Table 3-2; 5, Appendix D
Release via overland migration and/or flood	NS	NA

Notes:

NA Not applicable
NS Not scored

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: 0

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: 0

2.4.2.1.3 Volume

The information available is not sufficient to evaluate Tier C, hazardous volume quantity, as required by Reference 1, Section 2.4.2.1.3.

Hazardous Volume Quantity Assigned Value: 0

2.4.2.1.4 Area

Source No. 2 is considered to be the contaminated soil located throughout the Kerr McGee property. It is not known if all areas between sampling points are contaminated. Therefore, the area of Source No. 2 is undetermined, but greater than zero (Ref. 1, Section 2.4.2.1.4).

Sum (ft^2): Undetermined but greater than 0
Equation for Assigning Value (Ref. 1, Table 2-5): Area (A)/34,000

Area Assigned Value: >0

2.4.2.1.5 Source Hazardous Waste Quantity Value

Highest assigned value assigned from Reference 1, Table 2-5: >0

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 10: Summary of Source Descriptions						
			Containment Factor Value by Pathway			
					Air	
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	>0	No	10	NS	NS	NS
2	>0	No	10	NS	NS	NS

Notes:

>	Greater than
No.	Number
NS	Not scored

Description of Other Possible Sources:

Other sources of concern are present at the facility. However, insufficient information is available to evaluate the other potential sources. The sources include, but are not limited to, the following:

- Additional areas of contaminated soil on the south side of the former superphosphate plant, where the scrubber sludge from the superphosphate scrubber was piled (Ref. 14, p. 11).
- The dredge/fill pond is located in the northeastern portion of the former fertilizer manufacturing plant at Kerr McGee (Refs. 13, p. 2; 14, p. 11; 21, p. 25). The dredge/fill pond was a topographically low area on the Kerr McGee property that was used as a drying area for sediment that was dredged from the loading dock area on the St. Johns River (Refs. 14, pp. 4, 11; 21, p. 25). During operations, the dredge/fill pond was also used as a surface impoundment and occasionally received liquid from the pesticide surface impoundment (Source No. 1) (Refs. 13, p. 2; 14, pp. 4, 6, 11; 21, p. 25).
- Old backfilled surface impoundment

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Duval County lies within five physiographic subdivisions of the Coastal Plain Province: Atlantic Coastal Ridge, Center Park Ridge, Trail Ridge, Eastern Valley, and Duval Uplands. The majority of Duval County is in the Eastern Valley, while the southwestern portion of the county lies in the Trail Ridge and Duval Uplands physiographic features; the Atlantic beaches lie in the Atlantic Coastal Ridge (Ref 24, p. 3-4; 25, p. D8). The Kerr McGee property lies within the Eastern Valley. Elevations within the Eastern Valley ranges from sea level to about 100 feet above mean sea level (msl). These features are the result of primary deposition and subsequent erosion. Ridges are composed of sand that accumulated as beaches and offshore bars on the terraces of the Eastern Valley, and are characterized by thick sand sections at comparatively high land surface elevations (Ref. 24, p. 4; 25 p. D6, D8, D9). The elevation at the Kerr McGee property is between 5 and 10 feet above msl (Ref. 3).

Geologic units present in the vicinity of the Kerr McGee property are (in descending order): sediments of the Holocene and Pleistocene alluvium and terrace deposits; the Hawthorn Group (formerly the Hawthorn Formation), which includes the Charlton member, the Coosawhatchee Formation, the Marks Head Formation, and the Penny Farms Formation; the Ocala Group; the Avon Park Formation; the Oldsmar Formation; and the Cedar Keys Formation (Refs. 25, Table 2; 61 pp. 7, 8).

The Kerr McGee property is located on alluvium and terrace deposits from the Pleistocene to the Holocene epochs. Characteristics of these sediments include sand, medium to fine quartz, sometimes with shells and/or minor clay content. These sediments often have a hardpan layer of iron oxide-cemented rusty red to dark brown, medium to fine sand in the upper part of the section. This zone ranges in thickness from 0 to 90 feet bls; in the vicinity of the Kerr McGee property it is approximately 10 to 15 feet thick (Refs. 25, Table 2; 27, pp. 20, 26).

The Pleistocene and Holocene deposits are underlain by the Hawthorn Group of the Miocene epoch, which includes the Charlton member, Coosawhatchee Formation, Marks Head Formation, and Penny Farms Formation. These deposits are underlain by the Charlton Formation of the Pliocene epoch. The upper portion contains fine to coarse sand and gray to light gray sandy clay, clayey sand, and shell beds. The lower portion is composed of limestone, often highly sandy, porous, and cavernous. The Charlton Formation is approximately 10 to 110 feet thick and is a major source of water to shallow wells (Ref. 27, p. 20).

The Coosawhatchee Formation consists of quartz sandy, phosphatic, clayey dolostones to dolomitic, phosphatic, clayey quartz sands. The Marks Head Formation consists of complexly interbedded siliciclastics and carbonates that are variably quartz sandy, clayey, phosphatic dolostones interbedded with dolomitic, phosphatic, clayey quartz sands and dolomitic, phosphatic, quartz sandy clays. The Penny Farms Formation consists of carbonates that are variably quartz sandy, phosphatic, and clayey dolostones (Ref. 61, p 6). The total thickness of the Hawthorn group in the vicinity of the Kerr-McGee Property is approximately 500 Feet (Ref. 61, pp. 2, 3).

The Hawthorn Group unconformably overlies the Ocala Group (formerly the Ocala Limestone) of the Upper Eocene epoch (Refs. 25, Table 2, plate 4; 28, pp. 26, 28; 61 pp. 2, 3). The Ocala Group consists of white to gray, fossiliferous, recrystallized, porous limestone containing large solution cavities and caves in recharge areas. This formation lies within the upper Floridan aquifer and yields as much as 7,500 gallons per minute (gpm) near the top and base of the formation (Ref. 25, Table 2). The Ocala Limestone is approximately 470 feet bls and 300 feet thick in the vicinity of the Kerr McGee property (Refs. 26, Plate 26; 28, p. 34).

Underlying the Ocala Group is the Avon Park Formation of the Middle Eocene epoch. This unit consists of cream-colored to brown, chalky to well-indurated, pelletal to micitic limestone interbedded with cream-colored to dark brown, fine to medium crystalline, and slightly vuggy dolomite, which yields moderate to large amounts of water in northeast Florida (Ref. 25 Table 2, plate 4). The Avon Park Formation is approximately 775 feet bls and slightly more than 800 feet thick at the Kerr McGee property (Ref. 25, Table 2, Plates 3 and 4).

The Avon Park Formation is underlain by the Oldsmar Formation of the lower Eocene epoch. This formation consists of off white to light gray micritic limestone, interbedded with gray to light-brown, fine to medium crystalline, commonly vuggy dolomite. Some areas contain pore-filling gypsum and thin beds of anhydrite. The upper part acts as a semiconfining bed to the basal section, which yields large amounts of water (Ref. 25, Table 2). The Oldsmar Formation is approximately 1,600 feet bls and 400 feet thick at the Kerr McGee property (Ref. 26, Plates 4 and 5).

Underlying the Oldsmar Formation is the Cedar Keys Formation of the Paleocene epoch. This formation consists of gray and cream-colored dolomitized limestone containing gypsum, and finely crystalline dolomite and anhydrite. The Cedar Keys Formation is characterized by an extremely low permeability and acts as the confining unit for the Lower Floridan aquifer (Ref. 25, Table 2). The Cedar Keys Formation is approximately 2,000 feet bls in the vicinity of the Kerr McGee property (Ref. 26, Plate 3).

The Kerr McGee property is underlain by the following hydrostratigraphic units (in descending order): surficial aquifer, upper confining unit, Upper Floridan aquifer, middle semiconfining unit, and Lower Floridan aquifer, which includes the Fernandina permeable zone, and the lower confining unit (Ref. 25, Table 2, Plate 4). Groundwater flow in the Floridan Aquifer system is contained in solution-enlarged openings in carbonate formations; in the vicinity of Jacksonville, representing karst ground water flow (Ref. 24, p. 3, 5-6; 25, pp. 21-25).

The sediments of the Holocene and Pleistocene, and the upper Hawthorn Group comprise the shallow aquifer system in Duval County. The top of the The limestone section (112 to 140 feet bls) of the Hawthorn Group is the major water-yielding zone of the shallow aquifer system. Water from the shallow aquifer is primarily used for domestic purposes, particularly in rural areas not serviced by private or public utilities (Ref. 27, pp. 1, 22). Recharge to the shallow aquifer is directly from local rainfall (approximately 10 to 16 inches per year) and percolation from surface water bodies (Ref. 27, p. 30). Because of the proximity of the Kerr-McGee property to the St. Johns River, the estimated direction of ground water flow in the surficial aquifer is to the east (Ref. 3). Monitoring wells completed in the shallow aquifer at the Kerr McGee property range in depth from 12 to 75 feet bls (Ref. 5, Table 2-1).

Although sand beds of moderate permeability occur there, the upper confining unit primarily functions as a confining unit and separates the surficial aquifer from the Upper Floridan aquifer. In the vicinity of the Kerr McGee property, the upper confining unit occurs at approximately 150 feet bls and is approximately 425 feet thick (Ref. 25, Plate 4). The estimated leakance of the upper confining unit of the Floridan aquifer system is 10^{-6} to 10^{-5} feet per day per foot (Ref. 25, p. D29).

The Upper Floridan aquifer consists primarily of permeable zones within the Ocala Group. The Upper Floridan aquifer is encountered at approximately 470 feet bls and is approximately 200 feet thick in the vicinity of the Kerr McGee property (Ref. 25, Table 2, Plate 4). Half of the water pumped from the entire Floridan aquifer system in the Jacksonville area is estimated to come from the Upper Floridan aquifer

(Ref. 25, p. D21). The Upper Floridan aquifer generally flows to the southeast in the vicinity of the Kerr McGee facility (Ref. 25, plate 12).

The middle semiconfining unit underlies the Upper Floridan aquifer and consists mostly of an upper bed within the Avon Park Formation. The middle semiconfining unit occurs at approximately 670 feet bls and is about 250 feet thick in the vicinity of the Kerr McGee property (Ref. 25, Table 2, Plate 4). This semiconfining unit is breached by fractures that allow ground water to flow from the Lower to the Upper Floridan aquifer (Ref. 25, p. D22).

The Lower Floridan aquifer is composed primarily of permeable beds within the Avon Park, Oldsmar, and Cedar Keys Formations. The Lower Floridan aquifer occurs at approximately 920 feet bls and extends to approximately 2,400 feet (Ref. 25, Table 2, Plate 4; 53, p. 1-4). Although only about 10% of the water extracted from the Floridan aquifer system originates from the Lower Floridan aquifer, this unit, including the Fernandina permeable zone, is a major water source for the Jacksonville area and it supplies about half of the water to municipal and industrial wells (Ref. 25, pp. D22 and D54). Portions of the lower Floridan aquifer which overlay the Fernandina permeable zone consist of relatively discrete permeable intervals of hard, fractured, limestone or dolomite, separated by various thicknesses of relatively impermeable carbonate rocks (Ref. 53, p. 1-4). The Fernandina permeable zone was encountered from 1,800 to 2,400 feet bls in municipal wells located at the Arlington Water Treatment Plant located approximately 2 miles southeast of the Kerr McGee property (Ref. 25; 53, p. 1-4).

SUMMARY OF AQUIFERS BEING EVALUATED

TABLE 11: Summary of Aquifers Being Evaluated					
Aquifer No.	**Aquifer Name**	**Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Yes/No/NA)**	**Is Aquifer Continuous within 4-mile TDL? (Yes/No)**	**Is Aquifer Karst? (Yes/No)**	**References**
1	Surficial aquifer	NA	Yes	No	27, p. 20
3	Upper Floridan aquifer	No	Yes	Yes	25, Plates 5 and 6; 64
4	Lower Floridan aquifer	Yes	Yes	Yes	25, p. D22; 64

Notes:

NA Not applicable
TDL Target distance limit

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Surficial aquifer

Chemical Analysis

Kerr McGee Remedial Investigation – October 2004 Sampling Event

Background Samples

The background monitoring well ground water samples listed in Table 12 were collected in October 2004 by Shaw during the RI conducted on behalf of Kerr McGee (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). Ground water monitoring wells at the Kerr McGee property are completed in three zones of the surficial aquifer (Ref. 5, p. 2-6). Monitoring wells MW-20T and MW-22T are completed in the shallow zone of the surficial aquifer with total depths of 12 to 13 feet bls, and screened intervals of 2 to 13 feet bls (Ref. 5, Table 2-1, p. 5, Figure 2-3, Appendix K, pp. 34, 35, 37). Monitoring wells MW-20TD and MW-22TD are completed in the intermediate zone of the surficial aquifer at a depth of 45 feet bls and screened intervals of 40 to 45 feet bls (Ref. 5, Table 2-1, p. 5, Figure 2-3, Appendix K, pp. 36, 38). Monitoring well MW-11TVD is completed in the deep zone of the surficial aquifer at a depth of 75 feet bls and a screened interval of 70 to 75 feet bls (Ref. 5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 22). Monitoring wells MW-20T, MW-22T, MW-20TD, and MW-22TD were selected to represent background conditions in the shallow and intermediate zones of the surficial aquifer because ground water in the shallow and intermediate zones of the surficial aquifer flows to the southeast; therefore, those wells are located upgradient of ground water underlying Source Nos. 1and 2 at the Kerr McGee property (Refs. 5, Figures 3-9 and 3-13; 6, Figures 2-1 and 2-2). Monitoring well MW-11TDV was selected to represent background conditions in the deep zone of the surficial aquifer because ground water in the deep zone of the surficial aquifer flows to the north; therefore, MW-11TVD is located upgradient of ground water underlying the sources at the Kerr Mc10^{-4}Gee property (Refs. 5, Figure 3-14; 6, Figure 2-3). Also, the background ground water wells were selected based on water level data collected during well installation and sampling activities conducted during the RI. This data is presented in Table 2-2 and on Figures 3-9, 3-13, and 3-14 of Reference 5.

The ground water samples collected from the background monitoring wells are comparable to the ground water samples collected from monitoring wells located in the vicinity of and downgradient of sources at the Kerr McGee property because the samples were collected using similar sampling procedures from permanent monitoring wells completed in the surficial aquifer with similar construction details, depths, and screened intervals (Ref. 5, pp. 2-1, 2-6, through 2-12, Table 2-1, pp. 1 through 5, Appendix K, pp. 2 through 5, 8, 10 through 14, 17, 22, 23, 25, 34 through 38; 23, pp. 5-2 through 5-9).

The ground water samples were collected in accordance with the final RI/FS sampling plan (Ref. 5, p. 5-2 through 5-9). Chain of custody records are provided in Reference 29, pp. 62, 70, 79, and logbook notes are provided in Reference 5, Appendix D, pp. 157, 166, 176. The locations of the background monitoring wells listed in Table 12 are provided in Reference 5, Figure 2-3.

TABLE 12: Background Ground Water Samples					
Sample ID (KMC-SEI-)	**Depth (feet bls)**	**Screened Interval (feet bls)**	**Date Sampled**	**Location**	**References**
Background Ground Water Samples – Shallow Monitoring Wells					
MW-20T	13	3 to 12	10/28/2004	West side of Talleyrand Avenue, across from northwestern corner of the Kerr McGee property	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 34; 6, Figure 1-3
MW-22T	13	3 to 13	10/28/2004	Southwestern corner of Jaxport property, northwest of the Fasco building foundation	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 37; 6, Figure 1-3
Background Ground Water Sample – Intermediate Monitoring Wells					
MW-22TD	45	40 to 45	10/28/2004	Southwestern corner of Jaxport property, northwest of the Fasco building foundation	5, Table 2-1, p. 5, Figure 2-3, Appendix K, p. 38; 6, Figure 1-3
Background Ground Water Sample – Deep Monitoring Wells					
MW-11TVD	75	70 to 75	10/13/2004	Southern portion of Kerr McGee property, near southeast corner of the former specialty product warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 22; 6, Figure 1-3

Notes:

bls Below land surface
ID Identification
KMC Kerr McGee Chemical Corporation
MW Monitoring well
SEI Shaw Environmental, Inc.
T Shallow monitoring well (total depth between 12 and 13 feet bls)
TD Intermediate monitoring well (total depth of 45 feet bls)
TVD Deep monitoring well (total depth of 75 feet bls)

Background Concentrations

The background ground water samples listed in Table 13 were collected in October 2004 by Shaw as part of the RI conducted on behalf of Kerr McGee (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). The monitoring well ground water samples were analyzed for metals using EPA Method 6010B and pesticides using EPA Method 8081 (Ref. 5, Tables 2-5 and 2-6). Analytical data results are provided in Reference 36. The data validation reports are provided in Reference 48. SQLs were calculated using the laboratory reporting limits and the sample-specific dilution factors (Refs. 36, pp. 73, 97, 98, 295, 296, 321, 322; 39, pp. 5, 7, 8).

TABLE 13: Background Ground Water Concentrations				
Sample ID (KMC-SEI-)	**Hazardous Substance**	**Concentration (µg/L)**	**SQL (µg/L)**	**References**
Background Concentrations – Shallow Monitoring Wells				
MW-20T	Alpha-BHC	0.019J (0.19)	0.050	36, p. 295; 39, p. 7; 41; 48
MW-20T	Beta-BHC	0.050U	0.050	36, p. 295; 39, p. 7
MW-20T	Gamma-chlordane	0.050U	0.050	36, p. 295; 39, p. 7
MW-20T	DDD	0.0037J (0.037)	0.050	36, p. 295; 39, p. 7; 41; 48;
MW-22T	Dieldrin	0.10UJ	0.050	36, p. 295; 39, p. 9; 41; 48;
MW-22T	Endrin	0.10UJ	0.10	36, p. 295; 39, p. 9; 41; 48
MW-22T	Arsenic	12	5	36, p. 296; 39, p. 10
MW-22T	Lead	2.5J (3.27)	3	36, p. 296; 39, p. 10; 41; 48
Background Concentrations – Intermediate Monitoring Wells				
MW-22-TD	Beta-BHC	0.050U	0.050	36, p. 295; 39, p. 10
MW-22TD	Arsenic	6.1J (8.23)	5	36, p. 296; 39, p. 10; 41; 48
MW-22TD	Lead	5.0U	5	36, p. 296; 39, p. 10
Background Concentrations – Deep Monitoring Wells				
MW-11TVD	Arsenic	10U	10	36, p. 73; 39, p. 5
MW-11TVD	Lead	5.0U	5	36, p. 73; 39, p. 5

Notes:

µg/L Micrograms per liter
BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
ID Identification
J Estimated value. Concentrations reported between the method detection limit and the reporting limit. Sample results should be considered estimated with an unknown bias. The presence of the analyte is not in doubt. The value presented parenthetically is the concentration obtained by

applying EPA fact sheet *Using Qualified Data to Document an Obsered Release and Observed Contamination* (November 1996) (Ref. 41)

KMC Kerr McGee Chemical Corporation
MW Monitoring well
SEI Shaw Environmental, Inc.
T Shallow monitoring well (total depth between 12 and 20 feet bls)
TD Intermediate monitoring well (total depth between 33 and 48 feet bls)
TVD Deep monitoring well (total depth 75 feet bls)
U Compound was analyzed for, but not detected

Contaminated Samples

The contaminated monitoring well ground water samples listed in Table 14were collected in October 2004 by Shaw as part of the RI conducted on behalf of Kerr McGee (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). Monitoring wells MW-1T, MW-2T, MW-4T, MW-6T, MW-7T, MW-9T, and MW-12T are completed in the shallow zone of the surficial aquifer with total depths of 12 to 17 feet bls, and screened intervals of 2 to 17 feet bls (Ref. 5, Table 2-1, pp. 1, 2, 3, Figure 2-3, Appendix K, pp. 2, 4, 8, 10, 12, 17, 23). Monitoring wells MW-1TD, MW-2TD, MW-7TD, and MW-12TD are completed in the intermediate zone of the surficial aquifer at a depth of 40 to 48 feet bls and screened intervals of 35 to 48 feet bls (Ref. 5, Table 2-1, pp. 1, 2, Figure 2-3, Appendix K, pp. 3, 5, 11, 13, 24). Monitoring well MW-12TVD are completed in the deep zone of the surficial aquifer at a depth of 75 feet bls and a screened interval of 70 to 75 feet bls (Ref. 5, Table 2-1, pp. 1, 2, Figure 2-3, Appendix K, pp. 5, 14). Monitoring wells MW-1T, MW-1TD, MW-2T, MW-2TD, MW-4T, MW-6T, MW-6TD, MW-7T,MW-7TD, MW-7TVD, MW-9T, MW-12, and MW-12TVD are completed in areas underlying and downgradient of ground water flow from Source Nos. 1 and 2 at the Kerr McGee property (Ref. 5, Figure 2-3). The locations of the monitoring wells listed in Table 14 are provided in Reference 5, Figure 2-3.

Ground water samples collected from the contaminated monitoring wells are comparable to the ground water samples collected from the background monitoring wells listed in Table 12 because the samples were collected using similar sampling procedures from permanent monitoring wells completed in the surficial aquifer with similar construction details, depths, and screened intervals (Ref. 5, p. 2-1, 2-6 through 2-12, Table 2-1, pp. 1 through 5, Appendix K, pp. 2 through 5, 8, 10 through 14, 17, 22, 23, 25, 34 through 38). Chain of custody records are provided in Reference 29, pp. 60 to 66 and field documentation is provided in Reference 5, Appendix D, pp. 155 to 160, 163.

TABLE 14: Contaminated Ground Water Samples

Sample ID (KMC-SEI-)	Depth (feet bls)	Screened Interval (feet bls)	Date Sampled	Location	References
Contaminated Ground Water Samples – Shallow Monitoring Wells					
MW-1T	12	2 to 12	10/13/2004	At the northeastern corner of the former fertilizer building pad	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 158, Appendix K, p. 2; 6, Figure 1-3; 29, p. 62
MW-4T	12	2 to 12	10/27/2004	Northeast of Source No. 1, and north of herbicide building foundation	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 163, Appendix K, p. 8; 6, Figure 1-3; 29, p. 66
MW-7T	12	2 to 12	10/26/2004	Northwest of the Fasco building foundation	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 160, Appendix K, p. 12; 6, Figure 1-3; 29, p. 65
MW-9T	13	3 to 13	10/26/2004	At southwestern corner of former specialty product warehouse	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 160, Appendix K, p. 17; 6, Figure 1-3; 29, p. 64

TABLE 14: Contaminated Ground Water Samples					
Sample ID (KMC-SEI-)	**Depth (feet bls)**	**Screened Interval (feet bls)**	**Date Sampled**	**Location**	**References**
MW-12T	17	7 to 17	10/26/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix D, p. 160, Appendix K, p. 23; 6, Figure 1-3; 29, p. 65
Contaminated Ground Water Samples – Intermediate Monitoring Wells					
MW-1TD	40	35 to 40	10/13/2004	At the northeastern corner of the former fertilizer building pad	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 158, Appendix K, p. 3; 6, Figure 1-3; 29, p. 62
MW-2TD	48	43 to 48	10/14/2004	East of the former sulfuric acid plant	5, Table 2-1, p. 1, Figure 2-3, Appendix D, p. 157, 158, Appendix K, p. 5; 6, Figure 1-3; 29, p. 63
MW-7TD	46	41 to 46	10/14/2004	Northwest of the Fasco building foundation	5, Table 2-1, p. 2, Figure 2-3, Appendix K, p. 13; 6, Figure 1-3; 29, p. 63
MW-12TD	46	41 to 46	10/14/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 2, Figure 2-3, Appendix D, p. 163, Appendix K, p. 24; 6, Figure 1-3; 29, p. 66
Contaminated Ground Water Samples – Deep Monitoring Wells					
MW-12TVD	75	70 to 75	10/12/2004	North of former fertilizer plant storage warehouse	5, Table 2-1, p. 3, Figure 2-3, Appendix K, p. 25; 6, Figure 1-3; 29, p. 61

Notes:

bls	Below land surface
FD	Field duplicate
ID	Identification
KMC	Kerr McGee Chemical Corporation
MW	Monitoring well
SEI	Shaw Environmental, Inc.
T	Shallow monitoring well (total depth between 12 and 17 feet bls)
TD	Intermediate monitoring well (total depth between 40 and 48 feet bls)
TVD	Deep monitoring well (total depth of 75 feet bls)

Contaminated Concentrations

The contaminated ground water samples listed in Table 15 were collected in October 2004 by Shaw as part of the RI conducted on behalf of Kerr McGee (Ref. 5, p. 1-1, Table 2-6, Figure 2-3). The monitoring well ground water samples were analyzed for metals using EPA Method 6010B and pesticides using EPA Method 8081 (Ref. 5, Tables 2-5 and 2-6). Analytical data sheets are provided in Reference 36. The data validation reports are provided in Reference 48. SQLs were calculated using the laboratory reporting limits and the sample specific dilution factors (Refs. 36, pp. 39, 62, 63, 72, 73, 97, 98, 109, 110, 140, 141, 156, 156, 170, 224, 225, 254, 255, 277, 278; 39, pp. 1, 4 to 6, 11, 12, 14 to 16).

TABLE 15: Contaminated Concentrations				
Sample ID (KMC-SEI-)	**Hazardous Substance**	**Concentration (µg/L)**	**SQL (µg/L)**	**References**
Contaminated Concentrations – Shallow Monitoring Wells				
MW-1T	Beta-BHC	0.13	0.050	36, p. 72; 39, p. 1
MW-1T	Arsenic	490	0.005	36, p, 73; 39, p. 1
MW-2T	Beta-BHC	0.56	0.050	36, p. 109; 39, p. 11
MW-2T	Arsenic	56	10	36, p. 110; 39, p. 12
MW-4T	Alpha-BHC	310	100	36, p. 170; 39, p. 2
MW-4T	Beta-BHC	40	10	36, p. 170; 39, p. 2
MW-7T	Beta-BHC	1	0.050	36, p. 254; 39, p. 14
MW-7T	Gamma-chlordane	0.14	0.050	36, p. 254; 39, p. 14
MW-7T	DDD	0.27	0.10	36, p. 254; 39, p. 14
MW-9T	DDD	0.14	0.10	36, p. 156; 39, p. 4
MW-9T	Arsenic	44	10	36, p. 157; 39, p. 4
MW-12T	Alpha-BHC	150	25	36, p. 254; 39, p. 6
MW-12T	DDD	3.4	1	36, p. 254; 39, p. 5
MW-12T	Dieldrin	2	1	35, p. 254; 39, p. 6
MW-12T	Endrin	1.4	1	36, p. 254; 39, p. 6
MW-12T	Arsenic	1,700	10	26, p. 255; 39, p. 6
Contaminated Concentrations – Intermediate Monitoring Wells				
MW-1TD	Arsenic	62	10	36, p. 73; 39, p. 11
MW-1TD	Lead	20	5	36, p. 73; 39, p. 11
MW-2TD	Arsenic	54	10	36, p. 110; 39, p. 112
MW-2TD	Lead	14	19	36, p. 110; 39, p. 12

TABLE 15: Contaminated Concentrations				
Sample ID (KMC-SEI-)	**Hazardous Substance**	**Concentration (µg/L)**	**SQL (µg/L)**	**References**
MW-7TD	Beta-BHC	0.053	0.050	36, p. 109; 39. p. 14
MW-12TD	Arsenic	200	10	36, p. 181; 39, p. 16
Contaminated Concentrations – Deep Monitoring Wells				
MW-12TVD	Arsenic	34	10	36, p. 39; 39, p. 15
MW-12TVD	Lead	6	5	36, p. 39; 39, p. 15

Notes:

µg/L Micrograms per liter
BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
ID Identification
KMC Kerr McGee Chemical Corporation
MW Monitoring well
SEI Shaw Environmental, Inc.
SQL Sample quantitation limit
T Shallow monitoring well (total depth between 12 and 20 feet bls)
TD Intermediate monitoring well (total depth between 33 and 48 feet bls)
TVD Deep monitoring well (total depth 75 feet bls)

Attribution:

Kerr McGee operated a pesticide formulation plant and a fertilizer manufacturing plant at the property located at 1611 Talleyrand Avenue in Jacksonville, Florida, from June 1970 until 1978 (Refs. 13, p. 2; 14, p. 1; 7, p. 1).

Pesticide formulation operations consisted of pesticide blending and distribution (Ref. 14, p. 1). All active ingredients were purchased and blended with inert ingredients for the production of commercial pesticide products and distribution to customers (Ref. 14, pp. 1, 3). Pesticides were formulated at the facility in liquid, dust, granular, and pelletized forms (Ref. 14, p. 3). The pesticide production (Fasco) plant was divided into departments based on the form of pesticide produced (Ref. 14, p. 3). The departments for producing liquid pesticides were as follows: "Zinoil" unit; emulsifier unit; lime/sulfur unit, and small bottling unit (Ref. 14, p. 3). Pesticide dusts were produced in the following units: new sulfur plant; old sulfur plant; blenders #1, #2, #3; small package unit, and the J.B. Mill (Ref. 14, p. 3). Granular pesticide formulation took place inside the herbicide department, and the small package unit (Ref. 14, p. 3). Pelletized pesticides were also produced within the herbicide department (Ref. 14, p. 3).

Numerous pesticides were purchased for use at the pesticide formulation (Fasco) plant. Some of these pesticides included: endosulfan, methoxychlor, dieldrin, methylparathion, endrin, ethylparathion, toxaphene, heptachlor, aldrin, atrazine, BHC, lindane (gamma-BHC) chlordane petroleum derivative solvents and DDT among others (Ref. 14, Appendix A). Formulated pesticides were packaged at the facility prior to wholesale distribution (Ref. 14, p. 3).

Fertilizers were also blended at the Kerr McGee property (Ref. 14, p. 9). The only types of fertilizers produced at the facility were dry and pulverized, granular, and semi-granular in form (Ref. 14, p. 9). Raw materials used in fertilizer formulation included the following: anhydrous ammonia, ammonium nitrate, ammonium phosphate, potassium nitrate, superphosphate, phosphate rock, sulfur, sulfuric acid, potash, borax, manganese, iron sulfate, copper sulfate, zinc sulfate, urea, ammonium chloride, calcium carbonate, calcium nitrate, calcium sulfate, potassium chloride, potassium sulfate, and sodium nitrate (Ref. 14, Appendix B).

Analytical results of soil samples collected from Source Nos. 1 and 2 from October 2000 to December 2004 as part of the RI that Shaw conducted on behalf of Kerr McGee contained elevated concentrations of several raw product pesticides including endrin, endosulfan, dieldrin, DDT, toxaphene, heptachlor, alpha-BHC, and beta-BHC. Arsenic and lead, which were also used in pesticide formulation, were detected in Source Nos. 1 and 2 (Ref. 5, Appendix G, Tables G1 through G4) (also see Section 2.0 of this HRS documentation record). Ground water samples collected from shallow, intermediate, and deep monitoring wells at the Kerr McGee property contained the following pesticides at elevated concentrations: alpha-BHC, beta-BHC, DDD, DDE, dieldrin, endrin, gamma-chlordane, arsenic, and lead (Ref. 5, Appendix G, Tables G7 and G10) (see Section 3.0 of this HRS documentation record).

Hazardous Substances Released

Alpha-BHC, beta-BHC, DDD, DDE, dieldrin, endrin, gamma-chlordane, arsenic, and lead

Ground Water Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

3.1.2.1 Containment

TABLE 16: Ground Water Containment			
Source No.	**Source Hazardous Waste Quantity Value**	**Containment Factor Value, Description (Ref. 1, Table 3-2)**	**References**
1	100	10, no liner	5, Figures 4-37, 4-38; 12, p. 2; 13, p. 2; 14, pp. 5, 6
2	Undetermined, but greater than zero	10, no liner	5, Appendix D

Containment Factor Value: 10

3.1.2.2 Net Precipitation

Based on Reference 1, Figure 3-2, the net precipitation factor value for the Kerr McGee property located in Jacksonville, Florida is 3.

Net Precipitation Factor Value: 3
(Ref. 1, Figure 3-2)

3.1.2.3 Depth to Aquifer

Aquifer Being Evaluated: Interconnected Upper and Lower Floridan Aquifers

Depth to Lowest Known Point of Hazardous Substances (feet): 13 feet bls at subsurface soil sample KMC-IT-53-13 (Reference 5, Appendix D, p. 120; 29, p. 23; 34, p. 4; 38, p. 30).

TALE 17: Depth to Aquifer				
Aquifer/Layer (In descending order, beginning at lowest known point of hazardous substances)	**Karst? (Yes/No)**	**Thickness (feet)**	**Cumulative Thickness (feet)**	**References**
Surficial aquifer	No	150	137	27, pp. 1, 22, 30
Hawthorne Unit	No	425	562	25, Plate 6
Upper Floridan Aquifer	Yes	200	762	25, Table 2, Plate 2
Semi-confining unit	No	250	1,012	25, Table 2, Plate 2; 53, p. 1-4
Lower Floridan Aquifer	Yes	1,480	2,492	25, Table 2, Plate 2; 53, p. 1-4

Depth to Aquifer Factor Value: 1
(Ref. 1, Table 3-5)

3.1.2.4 Travel Time

TABLE 18: Travel Time				
Layer	**Type of Material**	**Thickness (feet)**	**Hydraulic Conductivity (cm/sec)**	**References**
Hawthorne Unit	Sand, clay, and dolomite, and sandy phosphatic dolomite and marl	425	10^{-6}	25, Table 2
Upper Floridan Aquifer	Porous limestone containing large solution cavities and caves in recharge areas; cream-colored to brown, chalky to well-indurated, pelletal to micitic limestone interbedded with cream-colored to dark brown, fine to medium crystalline, and slightly vuggy dolomite	450	10^{-4}	25, Table 2
Semi-confining unit	Limestone	120	10^{-4}	25, Table 2
Lower Floridan Aquifer	Cream-colored to brown, chalky to well-indurated, pelletal to micitic limestone interbedded with cream-colored to dark brown, fine to medium crystalline, and slightly vuggy dolomite,	1,450	10^{-2}	25, Table 2

Lowest Hydraulic Conductivity:
Thickness of Layer(s) with Lowest Hydraulic Conductivity (ft): 425

Travel Time Factor Value: 5
(Ref. 1, Table 3-7)

3.1.2.5 Calculation of Potential to Release Factor Value

Net Precipitation Factor Value: 3
Depth to Aquifer Factor Value: 1
Travel Time Factor Value: 5

Sum of Values: 9
Sum of Values x Containment Factor Value: $10 \times 9 = 90$

Potential to Release Factor Value: 90

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The toxicity and mobility factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 19. The combined toxicity and mobility factor values are assigned in accordance with Reference 1, Section 3.2.1. Hazardous substances detected in the observed release to ground water are assigned a mobility factor value of 1 (Ref. 1, Section 3.2.1.2).

TABLE 19: Groundwater Toxicity/Mobility

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Does Hazardous Substance Meet Observed Release? (Yes/No)	Toxicity/ Mobility (Table 3-9)	Reference
Alpha-BHC	1,2	10,000	1	Y	10,000	2, p. B-7
Beta-BHC	1,2	100	1	Y	100	2, p. B-7
Gamma- BHC	1,2	10,000	1	N	10,000	2, p. B-8
Alpha-chlordane	1,2	10,000	1E-2	N	100	2, p. B-3
Gamma-chlordane	1,2	10,000	1[a]	Y	10,000	2, p. B-3
DDD	1,2	100	1[a]	Y	100	2, p. B-4
DDE	1,2	100	1	N	100	2, p. B-4
DDT	2	1,000	1E-4	N	0.10	2, p. B-4
Dieldrin	1,2	10,000	1[a]	Y	10,000	2, p. B-5
Endosulfan I	2	100	1	N	100	2, p. B-6
Endosulfan II	1	100	1	N	100	2, p. B-6
Endrin	1	10,000	1E-2	N	100	2, p. B-6
Endrin aldehyde	2	0	1E-4	N	0	2, p. B-6
Endrin ketone	2	[b]	[b]	[b]	[b]	[b]
Heptachlor	2	1,000	1E-4	N	0.10	2, p. B-6
Toxaphene	2	1,000	1E-4	N		2, p. B-11
Arsenic	2	10,000	1	Y	10,000	2, p. B1
Lead	2	10,000	1	Y	10,000	2, p. B-8

Notes:

[a] Documented in observed release to ground water. A mobility factor value of 1 is assigned (Ref. 1, Section 3.2.1.2).

[b] Endrin ketone is Comprehensive Environmental Response, Compensation, and Liability Act hazardous substance; however, it is not listed in the Superfund Chemical Data Matrix

BHC Hexachlorocyclohexane
DDD Dichlorodiphenyldichloroethane
DDE Dichlorodiphenyldichloroethylene, p,p-
DDT Dichlorodiphenyltrichloroethane, 4,4-
No. Number

Toxicity/Mobility Factor Value: 10,000.00
(Reference 1, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 20: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Backfilled surface impoundment	166.66
2	Contaminated soil	Undetermined, but greater than zero

Sum of Values: 166.66

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Toxicity/Mobility Factor Value × Hazardous Waste Quantity Factor Value: 1,000,000

Waste Characteristics Factor Category Value: 32
(Ref. 1, Table 2-7)

3.3 TARGETS

Residents in Duval County, Florida are provided drinking water by the Jacksonville Electric Authority (JEA) (Refs. 3; 54; 55). In Duval County, Florida, the JEA service area is comprised of a Major Grid and the Mayport Grid (Ref. 62, p. 2). The major grid is subdivided into a north and a South Grid that form an interconnected distribution system (Refs. 54; 57; 62, p. 3). The Mayport grid is not connected to the Major grid and its wells are not located within the 4-mile radius of the Kerr McGee property (Ref. 62, p. 3). The North Grid serves residents to the north and west of the St. Johns River, and the South Grid serves residents to the south and east of the St. Johns River (Ref. 54, p. 1). The North Grid has nine water treatment plants (WTP) with a total of 60 wells and the South Grid has 13 WTPs with a total of 72 wells. The total number of wells in the JEA Major grid system is 132 wells. Water from the north and South Grids mix in the distribution lines forming one interconnected system (Ref. 54, pp. 1, 2, 3). The Major grid of JEA serves about 800,000 people (Ref. 57, p. 2). Therefore, each well in the Major grid (north and south) serve an average of about 6,060.60 people, which was calculated as follows: 800,000 ÷ 132 = 6,060.60 persons per well (Ref. 54, pp. 1, 2). All of the JEA wells are completed in the Floridan Aquifer system, which is comprised of the interconnected Upper and Lower Floridan aquifers (Refs. 53, pp. 1-1, 1-4, 4-2, 4-3; 54, p. 2).

Within the 4-mile radius of the Kerr McGee property, there are three North Grid wellfields with 21 municipal wells that serve about 127,272.6 people (21 wells × 6,060.60 persons per well) (Refs. 3; 54). Also, the South Grid has 3 wellfields with 16 municipal wells that serve about 96,969.6 people (16 wells × 6,060.60 persons per well) (Refs. 3; 54). The nearest JEA well to the Kerr McGee property is located in the North Grid about 1.1 miles to the west (Ref. 3). Table 21 provides the distance of each JEA well from the Kerr McGee property.

The total estimated population using ground water for drinking water within 4 miles of the Kerr McGee property is distributed as follows: 0 to 0.25 mile, 0 persons; greater than 0.25 to 0.50 mile, 0 persons; greater than 0.50 to 1 mile, 0 persons; 1 to miles, 72,727.20 persons; 2 to 3 miles, 48,484.8 persons; and greater than 3 to 4 miles, 103,030.20 persons) (see Table 22 of this HRS documentation record).

TABLE 21: Municipal Drinking Water Wells Within a 4-Mile Radius Of Kerr McGee Upper and Lower Floridan Aquifers								
Distance in Miles	Water Treatment Plant	Well No.	Depth in feet	Level I Cont. (Y/N)	Level II Cont. (Y/N)	Potentia l Cont. (Y/N)	Population Served	References
1.2	Main Street	0105	1,286	N	N	Y	6.060.60	3; 54, pp. 3 to 7
1.3	Main Street	0104	1,302	N	N	Y	6.060.60	3; 54, pp. 3 to 7
1.5	Arlington	5402	1,276	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.5	Main Street	0101	1,248	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.5	Main Street	0108	814	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.75	Arlington	5404	1,105	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.75	Arlington	5403	1,303	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.75	Main Street	0102	1,319	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.75	Main Street	0119	1,284	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.75	Main Street	0103	1,282	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.8	Arlington	5405	954	N	N	Y	6,060.60	3; 54, pp. 3 to 7
1.8	Main Street	0120	1,117	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2	Main Street	0107	1,282	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.2	Arlington	5406	963	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.4	Hendricks	5501	1,270	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.4	Hendricks	5502	1,252	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.6	Hendricks	5002	1,291	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.7	Hendricks	5001	1,297	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.75	Hendricks	5003	1,286	N	N	Y	6,060.60	3; 54, pp. 3 to 7
2.8	Hendricks	5108	1,296	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3	Hendricks	5107	1,012	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.1	Norwood	0404	1,200	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.3	Lovegrove	5204	1,030	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.3	Norwood	0401	1,288	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.4	Fairfax	0302	1,341	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.4	Hendricks	5110	1,320	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.4	Lovegrove	5201	1,005	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Fairfax	0304	1,235	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Fairfax	0308	1,020	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Fairfax	0307	1,365	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Lovegrove	5203	1,338	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Norwood	0403	1,303	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.5	Norwood	0402	1,356	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.6	Fairfax	0305	1,280	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.75	Fairfax	0301	1,362	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.8	Fairfax	0303	1,309	N	N	Y	6,060.60	3; 54, pp. 3 to 7
3.8	Fairfax	0306	1,300	N	N	Y	6,060.60	3; 54, pp. 3 to 7

Notes:

>	Greater than
Cont.	Contamination
N	No
WTP	Water treatment plant
Y	Yes

3.3.1 NEAREST WELL

Well ID: Main Street WTP, Well No. 5
Level of Contamination (I, II, or potential): Potential
If potential contamination, distance from source in miles: 1.2 miles

Nearest Well Factor Value: 20
(Ref. 1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

No Level I wells have been identified.

Level I Concentrations Factor Value: 0.00

3.3.2.3 Level II Concentrations

No Level II wells have been identified.

Level II Concentrations Factor Value: 0.00

3.3.2.4 Potential Contamination

Distance-weighted population values for potential contamination ground water targets for the interconnected Upper and Lower Floridan aquifers are presented in Table 22. Ground water flow in the Floridan aquifer system is contained in solution-enlarged openings in carbonate formations. In the vicinity of Jacksonville, Florida, this represents karst ground water flow (Refs. 24, pp. 3, 5, 6; 25, pp. D-21, through D-25). Karst ground water flow occurs in the Floridan aquifer within the entire 4-mile radius of the Kerr McGee property (Ref. 64).

TABLE 22: Distance-Weighted Population Values				
Distance Category	Number of wells	Population	Distance-Weighted Population Value (Ref. 1, Table 3-12)	References
0 to 1/4 mile	0	0	0	3; 54; 55; 57; 62
>1/4 to 1/2 mile	0	0	0	3; 54; 55; 57; 62
>1/2 to 1 mile	0	0	0	3; 54; 55; 57; 62
>1 to 2 miles	12	72727.20	26,068	3; 54; 55; 57; 62
>2 to 3 miles	8	48,484.80	26,068	3; 54; 55; 57; 62
>3 to 4 miles	17	103,030.20	81,623	3; 54; 55; 57; 62

Notes: > Greater than

Calculations:

Sum of Distance-Weighted Population Values: 133,759
Sum of Distance-Weighted Population Values/10: 13,375.9

Potential Contamination Factor Value: 13,375.9

3.3.3 RESOURCES

JEA provides water to customers for irrigation purposes (Ref. 54, p. 1). However, it is not known for which purpose the water is used. Therefore, resources were not scored.

Resources Factor Value: 0.00

3.3.4 WELLHEAD PROTECTION AREA

The Florida Department of Environmental Protection Wellhead Protection Program is a pollution prevention and management program that is designed to protect underground sources of drinking water from contamination. A wellhead protection area is defined as the surface and subsurface area surrounding a public water supply well, through which contaminants are reasonably likely to move toward and reach the well. The Wellhead Protection Rule establishes a 500-foot radius around all wells that serve community and nontransient, noncommunity public water systems (Ref. 52). Also, the City of Jacksonville has a well protection program and in general there is at least a 500-foot buffer around each well. However, the City of Jacksonville uses a 750-foot search radius around each proposed well to identify potential sources of known contamination (Ref. 54, p. 1)

Wellhead Protection Area Factor Value: 5.00